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TELEPHONE ENGINEER

VOLUME 28 OCTOBER, 1924 NUMBER 10

Dial Service Banishes Language Problems

People of All Nations Find it Easy to Use the Strowger Automatic Dial —It Speaks a Universal Language.

BEFORE the advent of the Strowger Automatic telephone system in such cosmopolitan cities as Buenos Aires, Argentina; Havana, Cuba; and Dairen, Manchuria, only those who could speak the language that the operators could understand could make telephone calls with ease.

Now in these places modern telephone service is available to all nationalities alike. The Strowger Automatic dial has eliminated the trouble in securing operators who could speak the necessary languages and has also eliminated the annoyance to subscribers who could not make themselves understood. All that is needed to use the Strowger Automatic telephone is a knowledge of the rudiments of counting.

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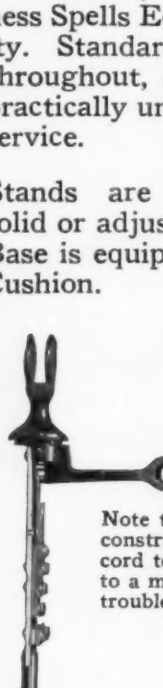

IN THE STEM

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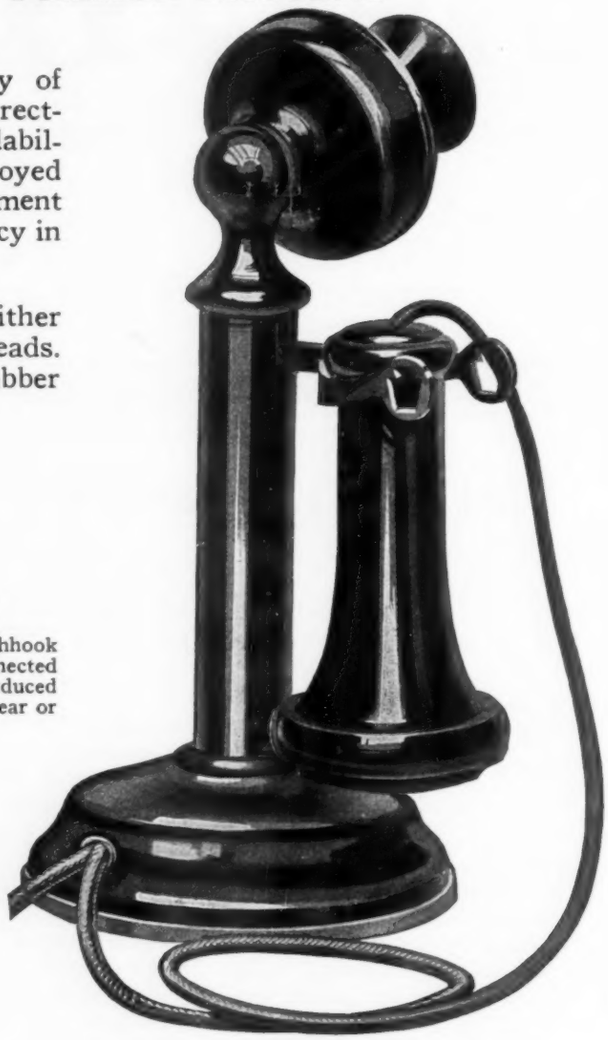

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A CONVENTION OF OPPORTUNITY

The approaching convention of the United States Independent Telephone Association is, in our opinion, one of the most important in the history of Independent Telephony. When it is over, we will know whether the Independent telephone companies are content to go along in the same old way, operating with the same methods, giving service as they have been doing, receiving the meager profits they have received; or whether they are awake to the opportunity for better operation, improved service and more adequate return for effort and capital invested in the business.

We are not finding fault with the operating methods of the past nor can the service be criticized unfavorably, for it has reached a remarkably high standard among the better companies in the Independent field. Neither can the companies be blamed entirely for the inadequate returns that they have been compelled to accept. As a class, Independent companies have done about all that could reasonably be expected from them. The early years of their history, like that of all pioneers, was a struggle for existence first, through the competitive era, and then against increasing expenses and inadequate revenue.

Now that life is assured for all the companies that desire it, there comes the opportunity for improvement of condition. The preservation of life was largely an individual problem that had to be worked out by each company in its own territory. Neighboring companies were sympathetic, but seldom could offer material assistance in the struggle. Associations could discuss ways and means and could offer suggestions, but the nature of the problem was such that the association could not solve it for the individual company.

Unlike the problem of maintaining existence, the problem of advancement is one that requires associated effort. Advancement comes through the exchange of ideas, the merging of experience and the working out of better ways of doing things. A man or a company can eke out an existence entirely alone, but for either to have even a moderate degree of comfort or convenience requires a combination of the efforts of a group.

The opportunity is here for advancement in the Independent telephone field. Organizations are available to do the work. There exists on paper a general staff making available the best talent in every division of the field. The question now is whether this general staff will ever begin to function. The coming convention can give the answer. If the matter is discussed in a perfunctory way and the usual resolutions are passed commending the Association officers for presenting the plan and then the whole matter allowed to go to oblivion as have some others in the past, we will have reason to be pessimistic over the future of the Independent industry.

This is the biggest issue before the Independent telephone companies today. If they recognize it as such, if they make the proper provision for the organization of the staff and for its work after it is organized, if they use the information that such a staff can supply, if they will provide adequate financial support so that the work may be carried on year after year, then we may look upon the Independent Group as an active, progressive component in the great telephone industry and one that is doing its full share in the improvement of communication and general welfare of the nation.

If it does not see the opportunity for advancement, then we may look for a gradual degeneration into a collection of isolated companies that will be content forever to drift along without hope or vision of doing anything in other than their own small way.

POLE LINE STRENGTH AND STORM DAMAGE

A useful piece of work has been done by the author of the article on "Safe Loads of Pole Lines," which appears in another column. The computation of the data which appear in the tables certainly must have involved no small amount of labor but the result is a large amount of definite information presented in a very condensed form. The article will warrant careful study on the part of those who have to do with the planning of aerial wire lines.

Our observations have shown that the telephone companies suffering most from storm damage are those having lines below the standard of construction and maintenance of those assumed in the study. As long as we have heavy open wire lines on slender poles, widely spaced; with decay at the ground line and leaning

due to poor maintenance, we will have excessive damage due to wind and sleet. The way to reduce this kind of damage is to build lines of proper strength on poles only long enough to give necessary clearance and after they are built to maintain them properly by periodic overhauling and replacement of weakened poles.

A MATTER OF PERCENTAGES.

Since the enforcement of the Eighteenth Amendment, the figure of "one-half of one percent" has come to have a special significance to many. Consumers of products that must stay within this limitation complain that the percentage is so small that the product has no "kick" in it. Carrying the idea over into the telephone industry (by analogy only, let it be understood) Independent association activities supported by less than one-half of one percent of gross revenues of Independent operating telephone companies, in the very nature of things, can have very little "punch" in them.

EXCHANGE BOUNDARY LINES

In his newsy monthly letters to the companies of his association, Secretary Ernest Irwin of the California State Association frequently touches upon matters that are worthy of editorial comment. In a recent letter he discussed exchange boundary lines as follows:

"While talking about exchange and primary rate areas, just a word or two may be said to member companies about the importance of having the primary rate area and exchange area of each exchange clearly defined and drawn out on a map available for general use.

Primary areas are, in general, well established, but the boundaries of exchange territories are frequently not so well fixed. When all utilities have their rates filed with the commission, with accompanying maps, questions of territory served should be easily settled. But do not file any map until sure that it is correct. Even with the most careful checking possible it has been found that boundary lines as filed by one company do not always agree with the filed boundary lines of neighboring exchanges; and when a map has been filed stick absolutely to the lines as shown; do not cross the line with your service under any condition.

"If it is absolutely necessary to cross the line, make arrangements with your neighbor, and file new maps, explaining the reason for the proposed change in boundary line, indicating it on the map, and have the change authorized before going ahead with any construction. And if you have service in someone else's filed territory and are maintaining it on account of an old overlap in territories, do not take on new service on that account, nor make any change in or addition to the existing service. Strict compliance with these principles will keep one on the safe side, out of trouble."

This is good advice not only in California, but in every other state.

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SERVICE PIRACY IN A NEW FORM

The old game of trying to get something for nothing seems to have broken out again, and telephone companies are the victims, if reports that have been received are correct. It seems that the representative of a well-known publishing house specializing in a woman's magazine appears in a city, makes arrangement with a local merchant to furnish headquarters and starts a campaign for subscriptions. This campaign is conducted entirely by telephone and the telephone company is expected to furnish service without extra pay for the work done. The telephone of the merchant who is a fellow victim with the telephone company is used by the solicitor who makes several hundred calls per day until the entire telephone directory is exhausted.

In two cases, the telephone companies refused to give this service gratis. One manager required the installation of a special telephone and the payment of the installation fee and one month's service. Even at that he got little enough when it was considered that his central office had to handle calls for nearly all of the several thousand telephones on the exchange while the telephone was in service.

We do not believe that any telephone company should submit to an imposition of this variety. The remedy is to refuse service until proper arrangements have been made and those arrangements should provide adequate compensation for the service rendered. It is strange that a business house of standing should attempt to put this thing over on another business. It is entirely possible that the idea of such a campaign is that of the solicitor rather than of the publishing house, but in any case the latter should receive immediate notice from the telephone company stating its surprise that such a practice be permitted.

Value of Your Property?

Has It Been Fairly and Fully Determined as of Present Date; or Is an Old and Obsolete Valuation Cheating Both You and Your Subscribers?—Some Depreciation Problems

By CHARLES W. MCKAY

It has been over six months since the writer last had the privilege of communicating with his friends in the telephone field, through the medium of Telephone Engineer. He can say, truthfully, that he has missed this monthly contact, which, prior to six months ago, had been existent for over two years. As stated in the May issue of Telephone Engineer, writer was obliged temporarily to discontinue his articles, in order to meet the requirements of an especially interesting, and rather involved valuation problem in the Independent telephone field.

In the course of this work, however, certain facts were brought home to the writer which he believes are well worthy of transmission to you, the readers of Telephone Engineer.

In the first place, the thought suggests itself that many telephone executives are inclined to overlook the fact that "plant dollars" are "real dollars." In other words, the *money equivalent* of your plant is worth as much (it should be worth far more) to you as money invested in mortgages, bonds, or money deposited in the banks. You, as a careful business man, doubtless keep close track of all of your private investments, but do you accord the same detailed attention to the actual present value today of your telephone property, taking into consideration accrued depreciation (both physical and functional depreciation) and possible appreciation—both the appreciation resultant from increased real estate values and the appreciation which naturally results from the use of the reproduction cost method of determining property values? Doubtless many of you do; I know that those who were responsible for my retention in the valuation problem referred to give most careful consideration to the importance of properly determining property values and to the inter-relation between this problem and the depreciation problem.

On the other hand, my observations during the past few months have led me to believe that many telephone executives are inclined to belittle the importance of the valuation problem, until some crisis arises that makes imperative an accurate knowledge of present-day values.

Fair Value of Your Property Today

This brings us to the thought suggested by the subject of this article. Original costs, or actual investment, by no means reflect the true, fair value of a going telephone property—unless these original costs have been incurred at a comparatively recent date. Take, for instance, the case of a plant; built some ten or fifteen years ago, and containing a relatively large amount of long-lived units of property, such as underground conduit, underground cable, heavy (treated) poles and, of course, the usual complement of subscribers' station and central office equipment. Under normal conditions, such a plant would be in relatively good condition at the present time, some ten or fifteen years after its original construction. The point I wish to make is that many telephone executives are inclined to regard the original cost of a telephone plant (the actual investment) as a measure of the true fair value of the property today. For obvious reasons, such a procedure would be unfair to the company, unfair to the security holders and, eventually it would be unfair to the subscribers. The reason why it would be unjust to the subscribers will be apparent if we but pause to consider that in such a case service rates would undoubtedly be based upon the valuation claimed by the company (the original cost valuation) and these service rates could not possibly be high enough to provide an adequate allowance for annual depreciation. The annual allowance for depreciation must be high enough to provide for replacement of plant, as it is retired from service at current market prices and, needless to say, current market prices today are from seventy-five to one hundred per cent higher than they were at the time this hypothetical plant was constructed. Therefore, even from the subscribers' standpoint, if we base our plant valuation upon old original costs (or, in other words, upon the actual investment made during a period prior to the present high price level) we are bound to be "way off the track."

To return, for a moment, to the subject of depreciation, as referred to in a preceding paragraph. The terms "physical" and "functional" depreciation were used. Those who have followed the valuation series, as presented in former issues of Telephone Engineer, doubtless will remember these terms and appreciate the distinctive significance which may be attached to their application in connection with the problem of determining the true present value of a telephone property.

Synopsis of Review of Depreciation

Depreciation has been authoritatively defined "a falling in value; reduction in worth," and also as "a lowering in worth." An excellent definition of depreciation has been given by Dr. R. H. Whitten in his book "Valuation of Public Service Corporations." Dr. Whitten says: "Depreciation can be defined as the lessened *utility* value caused by physical deterioration or lack of adaptation to function." The word "utility" undoubtedly is used by Dr. Whitten in its broader sense in other words, as a synonym for usefulness. Hence, it is especially apropos in formulating a definition of depreciation for use in connection with public *utility* properties.

There are two prime causes for depreciation—physical depreciation and functional depreciation. Physical depreciation may be subdivided into two classifications: the depreciation resultant from wear and tear, and the depreciation due to age and physical decay. Functional depreciation may also be divided into two classifications: the depreciation due to inadequacy, and the depreciation caused by obsolescence. There is still another cause of depreciation which is well worthy of consideration in connection with the problem of telephone property evaluation. This fifth cause may be termed "extraordinary depreciation." As the term suggests, it is that depreciation resultant from extraordinary causes such as hurricanes, floods, etc. We have had so many cases of "extraordinary depreciation" during this past unusual summer that all of us are inclined to accord more consideration to it than we normally would.

All of these causes of depreciation are so important, when one is considering the problem of determining true property values, that it may be well to review them individually—and in some detail.

Wear and Tear Depreciation

Depreciation due to wear and tear, as the term suggests, is that lessening in utility values resultant from actual use or service. This class of depreciation does not play as important a part in de-

termining the value of telephone properties as it does in determining the value of industrial properties. To illustrate, machinery which is in constant use naturally wears out and has to be replaced. In this case the wearing out process is a direct result of use. A telephone plant, on the other hand, is composed primarily of poles, cables, conduits, wires, subscribers' instruments and central office equipment. It requires no great stretch of imagination to see that actual *use* (the transmission of telephone messages) will not cause as rapid a depreciation here as in the case of machinery, which is subjected to actual mechanical strains. A possible exception to the foregoing may be found in the case of central office equipment. However, the items of central office equipment which are subjected to severe mechanical usage (switchboard cords, etc.) are constantly replaced, and this replacement is a maintenance rather than a depreciation problem.

Depreciation Due to Physical Decay. The second phase of depreciation—the depreciation resultant from age, natural deterioration or physical decay, plays a very important part in the determination of the present fair value of the telephone properties. Most property elements (such as poles, wire, cables, central office and subscribers' station equipment, etc.) have a known average life. In given cases, actual lives may be greater or less than the average lives as predetermined through experience studies. Nevertheless, the physical factor is a very real one to be taken into consideration in connection with the determination of present-day property values, and it is one that may be properly handled only through the medium of a systematic, careful examination of the various elements component to a telephone property. Such inspections or examinations should be made at reasonably frequent intervals.

The subject of functional depreciation will be discussed in the November installment of this series of articles, and it is proposed to follow this more or less theoretical discussion with practical suggestions as to ways and means of determining present value, with a minimum expenditure of time and money. It is possible to prepare telephone valuations at a relatively small cost and to formulate an accounting procedure which will enable a telephone executive to keep such a valuation up to date. The writer believes that this latter suggestion—that of keeping the valuation up to date—is most important. Many companies spend thousands of dollars for a complete plant valuation (for some special purpose, such as a rate case) and subsequently, allow this valuation to become out of date. When a new emergency arises, they are confronted with the necessity of practically duplicating the expenditure of time and money involved in making the original valuation.

Combined Telephone and Telegraph Data

The Bureau of the Census, U. S. Department of Agriculture, reports as follows in a bulletin on the "Census of Telegraphs for 1922," just issued:

"There was a considerable increase between 1917 and 1922 in the use of the telephone and a corresponding decrease in the use of the telegraph for train dispatching. Of the 166 railroads of Class I which reported for 1922, 43 used the telegraph only, 25 used the telephone only, 72 used the telegraph only on parts of their lines and the telephone only on the remainder, and 26 used the telephone and telegraph jointly or interchangeably over all parts of their lines. The proportion of the total mileage dispatched by telephone only increased from 43.3 per cent in 1917 to 46.6 per cent in 1922."

Telephone Wire on Railway Right of Way

"The railroads could not in all cases supply complete data regarding mileage of commercial wire along their lines. Some of the telegraph pole line reported by the Class I railroads carried telephone wire also, and 33,597 miles of additional pole line designated as "telephone" doubtless carried part of the telegraph wire. The total telephone wire mileage on the right of way of Class I railroads was reported as 586,259. Of this amount, the railroads owned 372,710 miles outright and 22,735 miles jointly with telephone and other companies, the remaining 190,814 miles being owned by telephone and other nonrailway companies; and the mileage of telephone wire operated either solely by the railroads or jointly by the railroads and other companies amounted to 424,317, or nearly three-fourths of the total."

Long-distance Business Over Telegraph Wires

"According to the annual report of the Postal Telegraph Cable Co. for 1922, as published in "Moody's," there has been a considerable development of long-distance telephone business over telegraph wires in the South and West. This telephone traffic, which does not interfere with the simultaneous transmission of telegraphic messages, may be regarded as a by-product."

Dates Set for Purdue Short Course

Announcement is made that Nov. 10 to Dec. 5 has been set for the annual four-weeks short course of instruction in telephone practice at Purdue University. The course is particularly designed for the men who have to do the work of constructing and maintaining telephone exchanges. Residents of the state of Indiana are admitted without charge. Complete announcements will be made within a few days. Further information may be secured by writing the School of Electrical Engineering, Purdue University, Lafayette, Ind., attention, R. V. Achatz.

California Independent Telephone Association Meets

On September 25 and 26, at the Athletic Club at Santa Monica, the California Independent Telephone Association met to discuss the problems of their business. Progressive programs were outlined and committees appointed to carry them out. Thursday afternoon the convention was called to order by President Chas. Rolfe and the report of the committee on rules was read and discussed at length. R. E. Cunningham of the Southern California Edison Co., was the first speaker Friday morning. He told how, by mutual agreement, poles had been jointly occupied, money had been saved for each company, and working conditions had been made safer for employees. J. E. McDonald, of the Los Angeles Joint Pole Committee, then spoke of the savings which joint use made possible. The purpose of the Joint Pole Committee, he said, is to settle difficulties and smooth out differences of opinions. J. E. McCaffrey told the meeting of the interest of the Railroad Commission in the use of joint poles. Frank Wright, Mr. Wardman, Mr. Mason and Mr. Terkel also participated in the general discussion, telling their experiences. Upon motion duly made, a committee was appointed to confer with the power companies.

After lunch Mr. McCaffrey spoke at some length on the electrical laws of the State and the Commission's General Order No. 64. The operation of the General Order has thus far produced good results. The Industrial Accident Commission reports fewer accidents, and working conditions have been improved.

Much important work is before the Association at the present time under consideration of its committees and a meeting will be called as soon as reports are ready for submittal, probably during November or early in December.

Western Carolina Telephone Co. has been incorporated at Franklin, N. C., with authorized capital of $25,000 and $4,000 subscribed by D. G. Stewart, Acworth Georgia, S. H. Lyle, A. W. Horn, and Sam L. Rogers, of Franklin, and others.

Figuring Safe Line Loads

Concrete Figures for Determining Safe Pole Line Loads Are Given—Computations for Seven Typical Types of Lines—Decay and Poor Alignment Effects

By J. M. WALSHE

Each year, ice and wind take their toll from the aerial lines of telephone, telegraph and railway companies. Thousands of poles are destroyed and hundreds of circuits are temporarily placed out of service. It is easy to say that this happens because the lines were not strong enough to carry the abnormal load, but it is not so easy to determine the kind of line that may be expected to remain in service under expected storm conditions. In order that some concrete facts might be available upon which to base a judgment of the relative advantages of different types of pole line construction, the author has undertaken the rather arduous task of computing the strength and stresses under assumed loads, of several types of line. The computations for seven types of line, which for the purposes of this study were assumed to be typical, are given in the tables which accompany this article.

The attention of the reader is called in particular to the properties of the lines with an ultimate capacity of ten wires and fifty wires, that is 5 circuits and 25 circuits. These two lines are typical of the new construction practice of using shorter and heavier poles which is being introduced.

The use of shorter poles on lines equipped with several crossarms reduces the possible clearance over roads. In the case of the 25 circuit line the bottom wires are only 11½ feet from the ground. When such a line has to provide a clearance of 25 feet over a railway it becomes necessary to use two or three longer poles on each side of such a crossing. These longer poles of course have all the weaknesses which the type of construction was evolved to overcome, including cost. There is a partial remedy for this which has been applied in some cases. This is a reduction in the spacing of the arms to about half their ordinary distance apart.

The additional risk of damage by threshing machines, plowing engines, hay loaders, and other objects is considerable, not to mention the boy with his .22 rifle. These conditions may render this type of line unsuitable in some localities, but if these conditions are neglected or do not exist this type of line offers definite advantages; its maintenance will be less, its first cost will be less both in material and construction and the con-

TABLE I.

	Ultimate line capacity, wires						
	4	10	12	20	40	50	100
1. Ultimate number of circuits	2	5	6	10	20	25	50
2. Length of poles in feet.	20	20	25	25	30	25	40
3. Diameter at top in ins...	4	6	5	6	7	10	8
4. Diameter 6 ft. from butt in ins.	7.5	8	8.5	9.5	10.5	12	12
5. Depth set in earth in ft.	4	4	5	5	5.5	5	6
6. Height to center of load in ft.	15	15	18.4	18.4	22	16.6	24
7. Ultimate number of brackets	4	....	....	....	....	....	....
8. Ultimate number of 6-pin crossarms	....	....	2	....	....	....	....
9. Ultimate number of 10-pin crossarms	....	1	....	2	4	5	10
10. Calculated strength of pole to a horizontal stress applied at center of load in lbs.	1,600	2,240	2,275	3,260	3,400	6,746	4,250
11. Poles per mile	33	36	33	36	40	40	40
12. Average length of span in ft.	160	146.6	160	146.6	132	132	132

TABLE II.

	Ultimate line capacity, wires						
	4	10	12	20	40	50	100
1. Area of one wire, one span long, area in sq. ft.	0.924	0.847	0.924	0.847	0.762	0.762	0.762
2. Ultimate number of wires	3.69	8.4	11.0	16.9	30.4	38.1	76.2
3. Stress in lbs. due to wind at 4 lbs. per sq. ft.	14.7	33.6	44	67.5	121	152	305
4. Stress at 8 lbs. as above.	29.5	67	88	135	243	304	610
5. Stress at 12 lbs. as above	43	100.8	133	203	364	456	915
6. Area in sq. ft. of one wire one span long with ice coat ¼ in. thick.	5.35	4.92	5.35	4.92	4.4	4.4	4.4
7. Ultimate area in sq. ft..	21.3	49.2	64.2	98.4	176	220	440
8. Stress at 4 lbs. as above.	85.2	196	256.8	395	704	880	1,760
9. Stress at 8 lbs. as above.	170	394	513	787	1,408	1,760	3,520
10. Stress at 12 lbs. as above	255	580	770	1,180	2,112	2,640	5,280
11. Area in sq. ft. one wire, one span long, with ice coat ½ in. thick.	9.81	9	9.81	9	8.08	8.08	8.08
12. Ultimate area in sq. ft..	39.2	90	117.6	180	323	404	808
13. Stress at 4 lbs. as above.	156	360	470	720	1,292	1,616	3,232
14. Stress at 8 lbs. as above.	312	720	936	1,440	2,584	3,232	6,464
15. Stress at 12 lbs. as above	472	1,080	1,410	2,160	3,880	4,848	9,696
16. Area in sq. ft. of one wire, one span long, with ice coat ¾ in. thick.	14.2	13.02	14.2	13.02	11.78	11.78	11.78
17. Ultimate area in sq. ft..	42.8	130.2	170	260	471	589	1,178
18. Stress at 4 lbs. as above.	171	520	680	1,040	1,870	2,350	4,712
19. Stress at 8 lbs. as above.	342	1,040	1,360	2,080	3,768	4,700	9,424
20. Stress at 12 lbs. as above	513	1,560	2,040	3,120	5,610	7,068	14,136
21. Strength of new poles (Table I, item 10)	1,600	2,240	2,275	3,260	3,400	6,746	4,250

tinuity of the service will be more certain. These properties also may result in longer life.

Table I shows the characteristics of seven types of lines under study. The values give an average for a medium class of construction. The poles are Northern white cedar, and the strength calculated from a table which appeared in an earlier number of TELEPHONE ENGINEER.*

Horizontal Load Due to Wind Pressure in Wires

In Table II are shown the stresses to which each type of line is exposed from wind pressure in the wires. The first item represents the area of a single wire .104 inches diameter and one span long; next is shown the area exposed when the ultimate number of wires are in place. The area of a circular object exposed to the wind is taken as two-thirds of its diameter. The pressure per square foot due to wind is proportional to the square of the velocity multiplied by a constant. The wind velocity of 30 miles per hour exerts a pressure of 4 pounds per square foot; a velocity of 42 miles per hour exerts a pressure of 8 pounds per square foot; and a velocity of 52 miles per hour exerts a pressure of 12 pounds per square foot. These are storm conditions which have been actually met.

The first three values of stress items, 3, 4 and 5 are calculated without any ice coating. The next three stresses, Items 8, 9 and 10, calculated for all seven types of lines, are for an ice coat ¼ inch in radial thickness, added to the diameter of the wire. The load exerted by a ¼-inch ice coat is a light load and with a wind pressure of 4 pounds per square foot, the types up to 40 wire have many times the strength necessary to resist this load as may be seen by comparing items 8 and 21 of Table II. The 40-wire line had nearly five times the necessary strength; the 50-wire line has nearly eight times the necessary strength; but the 100-wire line has less than two and a half times the necessary strength. Using the term factor of safety as applied to the above, the 40-wire line has a safety factor of 4.8, the 50-wire line has a safety factor of 7.6 and the 100-wire line has a safety factor of 2.3.

With a wind pressure of 8 pounds the smaller lines have ample strength and the 20-wire line has a safety factor of 4.1, the 40-wire line of 2.4, the 50-wire line of 3.8, and the 100-wire line of 1.2. With a wind pressure of 12 pounds the 100-wire line would be blown down.

The U. S. Bureau of Standards has included the following conditions in the National Electrical Safety Code, as standard conditions to be provided for in the heavy sleet loading area which covers all the eastern, middle-west and western states north of Arkansas. The conditions are, a layer of ice ½ inch radial thickness, combined with a horizontal wind pressure of 8 pounds per square foot on the projected area of the ice covered conductor.

The next three stresses, items 13, 14 and 15, are calculated for an ice coat of ½ inch radial thickness with wind pressures as before. The stress for a pressure of 8 pounds per square foot is the one taken for the standard conditions just quoted. It will be seen that the 4-wire line has a safety factor of 5.1, the 10-wire line a safety factor of 3.0, the 12-wire line a safety factor of 2.4, the 20-wire line a safety factor of 2.2, the 40-wire line a safety factor of 1.3, the 50-wire line a safety factor of 2.0 and the 100-wire line is destroyed.

The last three stresses, items 18, 19 and 20, Table II, are for a ¾-inch coat which has often been experienced. At a pressure of 4 pounds the only one to fail is the 100-wire line. At a pressure of 8 pounds the 40-wire line also fails, and at a wind pressure of 12 pounds the 20, 40, 50 and 100-wire lines probably would fail. The 20-wire line is shown to have a small excess of resistance over the stress but the pressure of the wind on the pole and fittings will just about make up this difference. In all of these calculations it is assumed that the only unbalanced load is the wind pressure on

TABLE III.

	Ultimate line capacity, wires						
	4	10	12	20	40	50	100
1. Volume of a span of .104 copper in cu. in....	16.31	14.95	16.31	14.95	13.5	13.5	13.5
2. Volume of ice coat ¼ in. thick in cu. ins. per span.	533	489	533	489	440	440	440
3. Volume of ice coat ½ in. thick in cu. in. per span	1,821	1,667	1,821	1,667	1,506	1,506	1,506
4. Volume ice coat ¾ in. thick in cu. in. per span.	3,863	3,545	3,863	3,545	3,186	3,186	3,186
5. Ultimate volume of ice coat ¼ in. thick, cu. in.	2,130	4,890	6,400	9,750	17,600	22,025	44,050
6. Ultimate volume of ice coat ½ in. thick, cu. in.	7,275	16,670	21,800	33,300	60,100	75,200	150,600
7. Ultimate volume of ice coat ¾ in. thick, cu. in.	15,320	35,890	46,400	70,700	127,200	159,300	318,650
8. Weight in lbs. of ultimate volume of ¼ in. ice coat.....	71.5	164	215	327	558	739	1,480
9. Weight in lbs. of ultimate volume of ½ in. ice coat.....	244	560	731	1,120	2,020	2,525	5,050
10. Weight in lbs. of ultimate volume of ¾ in. ice coat.....	514	1,199	1,560	2,350	4,260	5,352	10,700
11. Weight of copper per circuit in lbs.....	10.48	9.6	10.48	9.6	8.65	8.65	8.65
12. Weight of ultimate number of copper circuits..	20.96	48	62.88	96.0	173	216	432

TABLE IV.

	Ultimate line capacity, wires						
	4	10	12	20	40	50	100
1. Brackets	2.0	....	....	....	....	....	....
2. Nails, 4 in.....	.25	....	....	....	....	....	....
3. Nails, 6 in.....	.4	....	....	....	....	....	....
4. Tie wires.....	.25	.625	.75	1.25	2.5	3.125	6.25
5. Insulators	3.15	7.85	9.4	15.75	31.5	39.25	78.5
6. Crossarms, 10-pin.....	....	30.0	....	60.0	120.0	150.0	300.0
7. Crossarms, 6-pin.....	....	....	40.0	....	....	....	....
8. Arm braces.....	....	1.5	3.0	3.0	6.0	7.5	15.0
9. Wood pins.....	....	1.6	1.99	3.2	6.4	8.0	16.0
10. Carriage bolts.....	....	.12	.25	.25	.5	.6	1.2
11. Machine bolts.....	....	1.4	2.8	2.8	5.6	7.0	14.0
12. Washers, round.....	....	.125	.25	.25	.35	.62	1.25
13. Washers, square.....	....	.5	1.0	1.0	2.0	2.5	5.0
14. Lag screws.....	....	.2	.4	.4	.8	1.0	2.0
15. Shingle nails.....	....	.05	.06	.1	.2	.25	.5
16. Totals of these items in lbs.	6	45	59.9	88	178	219.8	439.7

*Strength of Telephone Poles, by J. M. Walshe. Sept., 1923, p. 17.

the wires. Such pressures on poles and fittings will be taken into account later.

Vertical Loads and Weight of Pole Fittings.

In Table III the volumes of the loads are calculated, items 1 to 7, inclusive, and below them, items 8 to 12, inclusive, the weight in pounds of three thicknesses of ice coating. The volumes in cubic inches are large quantities but when divided by the weight of 1 cubic inch of ice do not seem so excessive. The greatest load of 10,700 pounds at the top of a 40-foot pole is a considerable fraction of the compression strength of a column of such dimensions.

Table IV gives approximate weights for the pole fittings necessary to support the various number of wires and with the exception of the 4-wire line these weights are very close to the weight of the copper they support.

Strength of Pole Is Materially Decreased by Decay at Ground Line

Table V is perhaps the most important table as it shows what may be expected from poles which have rot at the ground line. The small amount of ½ inch of rot has a very serious consequence in the case of small poles and becomes of less consequence with larger sizes. One inch of rot halves the strength of the medium sizes and reduces the strength of 12-inch diameter poles to approximately 60 per cent of the strength of a new pole. These figures present a very strong argument in favor of some form of butt treatment.

The author was unable to obtain reliable figures for the strength of poles less than 6 inches diameter and has therefore left blanks in this table where such figures should be found.

Stresses Are Increased When Poles Lean

Another factor that has not been given sufficient attention is the result of allowing poles to lean. In Table VI are given calculations showing the proportion of the total pole load which becomes a horizontal stress when the pole is allowed to lean. It will be seen that this becomes a very important factor when wind pressure has to be resisted or when rot is also present.

The pole set 90 degrees from the horizontal may in a few years lean to 82 degrees and in bad cases individual poles may lean to 70 degrees before they are given attention. Needless to say the deflection will depend on the standard of maintenance practiced.

Table VII gives the wind pressure in pounds exerted on the pole and fittings of each class of line at different wind velocities as represented in pounds per square foot. These values are small, but they are of interest because they show that the allowance made for this stress is a small fraction of that caused by the conductors.

TABLE V.

	Ultimate line capacity, wires						
	4	10	12	20	40	50	100
1. Calculated strength of new pole to a side pull exerted at center of load	1,600	2,240	2,275	3,260	3,400	6,746	4,250
2. Strength of pole with ½ in. of rot at ground line	666	1,130	1,360	2,280	2,580	5,120	3,540
3. Strength of pole with 1 in. of rot at ground line.	....	....	544	1,360	1,910	4,050	2,780
4. Strength of pole with 1½ in. of rot at ground line	....	....	....	544	1,135	3,000	2,080
5. Strength of pole with 2 ins. of rot at ground line	....	....	....	....	445	1,980	1,370
6. Strength of pole with 2½ ins. of rot at ground line	....	....	....	....	....	1,020	708

TABLE VI.

	Ultimate line capacity, wires						
	4	10	12	20	40	50	100
1. Ultimate possible load including wire and fittings with ¼ in. ice coat, lbs.	98	257	337	511	909	1,174	2,351
2. Side pull with pole leaning 86°	6	18	23	35	63	81	165
3. Side pull with pole leaning 82°	13	34	46	71	125	162	320
4. Side pull with pole leaning 75°	24	66	87	126	225	300	610
5. Side pull with pole leaning 70°	33	88	115	172	310	400	800
6. Ultimate possible load including wire and fittings with ½ in. ice coat, lbs.	271	653	853	1,304	2,371	2,960	5,921
7. Side pull with pole leaning 86°	18	45	59	94	166	206	410
8. Side pull with pole leaning 82°	37	90	118	186	330	410	820
9. Side pull with pole leaning 75°	70	169	220	330	610	770	1,540
10. Side pull with pole leaning 70°	92	220	290	440	810	1,010	2,020
11. Ultimate possible load including wire and fittings with ¾ in. ice coat, lbs.	541	1,292	1,682	2,534	4,611	5,787	11,570
12. Side pull with pole leaning to 86°	38	90	117	176	320	400	800
13. Side pull with pole leaning to 82°	75	179	230	350	640	800	1,600
14. Side pull with pole leaning to 75°	142	330	430	650	1,160	1,480	2,900
15. Side pull with pole leaning to 70°	184	440	570	860	1,570	1,940	3,900

TABLE VII.

	Ultimate line capacity, wires						
	4	10	12	20	40	50	100
1. Area of pole and fittings exposed to wind	6.1	7.6	9.4	10.4	15	15.7	23.4
2. Side pull with wind at 4 lbs. per sq. ft., lbs.	24	30	37	41	60	62	93
3. Side pull with wind at 8 lbs. per sq. ft., lbs.	48	60	75	82	120	125	187
4. Side pull with wind at 12 lbs. per sq. ft., lbs.	73	91	112	124	180	188	280

Examples of Use of Tables

Table VIII assumes particular conditions in two cases for each class of line and shows the use of the foregoing tables. In the first case even the 100-wire line has a safety factor of 1.8 and the others could be far more heavily loaded.

In the second case the conditions are more severe than those imposed by the National Electric Code and all the lines would be destroyed. The last line of figures gives the strength of new seasoned poles, free from rot but leaning to 75 degrees. Even now the last five classes all fail to carry the load imposed.

It will be noticed that the two classes of lines which resist the stresses best are the 10-wire line and the 50-wire line. As these are the two types of line being introduced, it is evident that they are being introduced with good reason.

As regards the other classes it becomes evident that the 4-wire line is much stronger than necessary and the 100-wire line is below the standard set by the National Electrical Safety Code and should not be used in the area subject to heavy sleet loads.

The foregoing study of pole conditions was made chiefly for purposes of comparison. For this reason the figures were considered to be sufficiently accurate when within five per cent. It is believed they present the subject in a new way which will be helpful to those whose work deals with pole line problems.

TABLE VIII.

Conditions—Case 1:	Ultimate line capacity, wires 4	10	12	20	40	50	100
1. Stress due to wind 4 lbs. with ¼ in. ice (Table II, Item 8)	85.2	196	256	395	704	880	1,760
2. Additional stress leaning to 86° (Table VI, Item 2)	6	18	23	35	63	81	165
3. Total stress	91	214	279	430	767	961	1,925
4. Total strength, pole rot, ½ in. (Table V, Item 2)	666	1,130	1,360	2,280	2,580	5,120	3,540
Case 2:							
5. Stress due to wind, 12 lbs. with ¾ in. ice (Table II, Item 20)	513	1,560	2,040	3,120	5,610	7,068	14,136
6. Additional stress, leaning to 75° (Table VI, Item 14)	142	330	430	650	1,160	1,480	2,900
7. Total stress	655	1,890	2,470	3,770	6,770	8,540	17,036
8. Total strength, pole rot, 2 in. (Table V, Item 5).	....	....	....	....	445	1,980	1,370
9. Total strength without pole rot (Table I, Item 20)	1,600	2,240	2,275	3,260	3,400	6,746	4,250

OUR LITERARY DIGEST

Review of Recent Publications on the Telephone and Allied Subjects

An Introduction to the Strowger System of Automatic Telephony, by H. H. Harrison, Longmans, Green and Co., New York.

Of quite a different character than the preceding publication is this work on the Strowger system by another English author. Designed as a text for classroom instruction, it is limited to the discussion of a single system. Starting from an elementary system employing simple switches, the author shows the fundamental operation of setting up the connection by electro-mechanical mechanisms. The ideas are then extended to the two motion switch and to larger systems, introducing the trunking system and the primary and secondary line switches. The details of the mechanical features of the switches are given by line drawings in a much more complete way than in many other elementary text books which assume that the student is familiar with the mechanism.

Another interesting device and one which adds to the clarity of the discussion of switch operation is the current-time diagram showing the time elements in the operation of the various relays and magnets. In the final chapter is a discussion of supervisory features and the interconnection of manual and automatic systems. As a moderate priced introductory work, the book forms a valuable addition to the growing literature of mechanical switching of telephone lines.

Atmosphariesche Stoerungen in der drahtlosen N a c h r ichtenuebermittlung, by Dr. A. Koerts. Published by M. Krayn, Berlin.

This publication in the German is a large pamphlet of 148 pages devoted to a theoretical and mathematical study of the causes and effects of atmospheric disturbances observed in the reception of radio signals. Beginning with the study of oscillating systems and their properties, the author takes up in succession the general nature of disturbances, the effect of coupled circuits on disturbance, and directional effects of various types of receiving systems. In his conclusions he discusses various means of reducing the disturbances but does not hold forth much hope that any receiving system entirely free from static will ever be developed. The pamphlet contains a bibliography of the literature of the subject. This publication will be of considerable interest to those who are making extensive studies of radio transmission with particular reference to the possibility of reducing disturbances.

Automatic Telephone Systems, Vol. 3, by W. Aitken. D. Van Nostrand Co., New York.

This is the third and concluding volume of a monumental work on Automatic Telephone Systems, reviews of the previous volumes of which have already appeared in these columns. The treatment is the same in the three volumes, the circuits for all systems having been redrawn and the operations being described by the method designated by the author as the "bus route" scheme. The present volume takes up the Strowger director system and gives some additional information on the Western Electric Panel System. It also describes the Ericsson wire bank system concerning which very little information has been published in this country. There are also sections on interconnection of manual and automatic systems, call registers, trunk and toll line systems, wiring and cabling lay-out, power plant, traffic problems and a number of miscellaneous subjects. The three volumes of this work, taken together, form almost a complete reference library on the present state of the technical features of automatic telephony.

Gettysburg, Pa.—The Goodyear, Mount Tabor and Uriah Telephone Company has been incorporated to serve approximately 100 subscribers in Cumberland and Adams counties. The new corporation takes over an unincorporated company.

Columbus, Ohio—Dr. Thomas Jefferson Sanders of Westerville has been elected president of the International Telephone Company and the organization following lifting of the company's receivership.

Newell, S. D.—Newell Rural Telephone Company has been incorporated by H. A. Calhoun, Harold Beckman and Oscar Matthews. Capital, $10,000.

Independents' National Meet

Annual Convention of U. S. Independent Telephone Association Will Be Held at Chicago, October 21-24—A Practical Program Prepared for the Event—New Directors to Be Chosen

Chicago, Ill.—Again convention time for the U. S. Independent Telephone Association approaches and all signs point to an affair that will stress the practical value of such events. This year's convention will be held at Hotel Sherman, Chicago, October 21-24.

The program, which is to yield abundant ideas of immediate application to the plants of association members, indicates that Independent telephony will be well covered by the speakers and their topics. It follows:

Convention Program

TUESDAY, OCTOBER 21.

10:00 a. m.—

Meeting of Board of Directors.

Registration.

Opening of Exhibits.

2:30 p. m.—

General Opening Session (Tiger Room).

Report of Secretary-Treasurer C. C. Deering.

Report of Accounting Division, A. C. Cragg, Chairman.

Report of Plant Division, A. L. Staderman, Chairman.

Report of Committee on Long Distance Operating Rules.

Report of President F. B. MacKinnon.

Appointment of Convention Committee.

Miscellaneous Business.

WEDNESDAY, OCTOBER 22.

10:00 a. m.—

General Session.

Address: "Commission Control of Telephone Companies from the Public Viewpoint," Prof. C. O. Ruggles, Professor of Transportation and Public Utilities, Ohio State University, Columbus, Ohio.

Address: "Commission Control of Telephone Companies from the Commission Viewpoint," Hon. Lewis H. Gettle, Chairman, Wisconsin Railroad Commission, Madison, Wis.

1:30 p. m. —

Plant Conference, A. L. Staderman, Chairman.

Accounting Conference, A. C. Cragg, Chairman.

Traffic Conference, C. C. Deering, Chairman.

Annual Election of Directors.

THURSDAY, OCTOBER 23, PIONEERS' DAY.

10:00 a. m.—

Joint Session, U. S. Assn. and Independent Pioneers' Assn.

Address: "A Pioneer to Pioneers," General John J. Carty, Vice-President, American Telephone and Telegraph Co., New York.

12:00 Noon—

Annual business meeting of Pioneers' Association.

1:00 p. m.—

Annual Pioneers' Luncheon and Entertainment.

FRIDAY, OCTOBER 24.

9:30 a. m.—

Discussion: "Financing of Small Companies," "Storm Insurance," "Liability Insurance." Miscellaneous Business and Reports of Committees. Adjournment.

1:00 p. m.—

Annual Luncheon and Conference of State Association Executives.

Manufacturers are paying particular attention to the educational possibilities of their exhibits and several of the companies whose products will be on display will show for the first time new products and refinements in their equipment. All exhibit space has been taken.

To Pick New Directors

The terms of 10 of the association's directors expire at the time of the forthcoming meeting. Successors will be chosen for these members of the board: H. L. Beyer, J. C. Duncan, E. D. Glandon, F. B. MacKinnon, R. E. Mattison, Houck McHenry, Ben Woodbury, E. M. Prisk, L. Q. Trumbull and W. J. Uhl.

All railroads have agreed to make a rate of fare-and-a-half for the convention round trip, under the dual convention certificate plan. Attendance at the convention gives every promise now of being so large that it is the part of wisdom to immediately make room reservations at the Sherman.

Pioneers to Gather

Independent veterans again will command the spotlight for one day of the convention. Preliminary plans for the annual party of the Independent Pioneer Telephone Association are being made by the entertainment committee appointed by President H. E. Bradley. George Rodomer is chairman of this committee, and E. I. Pratt is secretary and treasurer. The committee consists of: G. W. Rodormer, Reliable Electric Co.; F. L. Eldridge, French Battery & Carbon Co.; O. V. Dodge, Automatic Electric Co.; J. F. Jaap, Cook Electric Co.; H. T. McCaig, Stromberg-Carlson Telephone Mfg. Co.; J. Spangler, National Carbon Co., and Edw. I. Pratt, Kellogg Switchboard & Supply Co.

At last year's convention the Independent lunch and entertainment was arranged for a record-breaking crowd, but despite the well-laid plans the space provided proved too small to care for the crowd, and the party played to "standing room only." This year, provision is being made to care for all comers, and the old-timers assure a show to be remembered along with other famous festivals in future "way-back-when" discussions.

COMING CONVENTIONS

U. S. Independent Telephone Assn.—Hotel Sherman, Chicago, Oct. 21-24.

Illinois—Peoria, Jefferson Hotel, Nov. 12-13.

South Dakota—Aberdeen, Jan. 14-16.

North Dakota—March 10-12.

Kansas—Topeka, Hotel Kansan, April 7-9.

Maine Meets and Elects New Officers

At the fourth annual meeting of the Maine Telephone Association, held at the Augusta House, Augusta, Me., September 11 and 12, directors were elected for the ensuing year, as follows: William J. Thompson, South China; F. W. Story, Boston; A. Van Don, Kerkhoven, Bethel; A. F. Winslow, Standish; H. F. Hilton, Poland; Herbert E. Foster, Winthrop, and George Chandler, Norridgewock

Southern Bell Wins South Carolina Rate Case

In the South Carolina rate case of the Southern Bell Telephone & Telegraph Co., Special Master J. Waites Waring reports to the United States district court for the eastern district of the state. That the value of the property of the Southern Bell Co. devoted exclusively to intrastate business in South Carolina is $7,000,000. The proper income, he finds, should be 8 per cent upon this valuation of $7,000,000, or $560,000; the actual income, during the year 1923, however, was $376,292, or only 5.38 per cent; hence the company is entitled to increased rates.

United States Has 63%

This Nation Operates Majority of Telephones in the World—Omaha, Neb., Shows Highest Number Per Capita—New York Has Most Telephones of Any City—Interesting Official Data

The United States has in service 63 per cent of all the telephones in the world. In proportion to population this country has ten times as many telephones as has the world at large. The average American uses the telephone nine times as much as the average Englishman, and ten times as much as the average Frenchman. There are more telephones in New York City than in the whole of Great Britain and Northern Ireland; more in the City of Chicago than in all of France. In rural telephone development, America stands head and shoulders above the rest of the world. These and other striking facts, illustrative of this country's unchallenged leadership in the telephone field, are brought out by a recent study made by the American Telephone and Telegraph Co. of the telephone systems of all countries.

World Has Twenty-three Million Telephones

This study shows that on Jan. 1, 1923, there were 22,904,415 telephones in use throughout the world, of which 14,347,395 were in the United States. Thus the American people, who form but one-sixteenth of the earth's population, have at their service nearly two-thirds of all the telephones in existence. Europe, with four times as many people as this country, has only about two-fifths as many telephones. On the date to which these figures relate, there were 5,863,684 telephones in Europe, or but little more than one-quarter of the world's total. All other countries, including the entire Western Hemisphere outside of the United States and Asia, Africa and Oceania as well, had only one-ninth of the total telephones in operation. Of the 1,100,161 telephones added in 1922 to the wire systems of the world, 620,670 represented the net growth of the telephone facilities in the United States.

America's Leadership Is Pronounced

In number of telephones per 100 population, America's leadership was even more pronounced. There were, on Jan. 1, 1923, 13.1 telephones for every 100 persons in the United States, as compared with 3.5 telephones for every 100 in Germany, 2.3 in Great Britain and Northern Ireland, 1.3 in France and 0.3 in Italy. Although Japan had the best developed telephone system of any Asiatic country, she could boast only 0.9 telephones per 100 inhabitants, even prior to the earthquake of September, 1923.

(Continued on following page)

Hoosier Sessions Draw 250

Lively Meeting Held at Indianapolis

Indianapolis, Ind.—President Henry A. Barnhart at the annual meeting of the Indiana Telephone Association brought home to the 250 men in attendance at the affair the need for further education of the public with respect to the easily understandable technicalities of the telephone business, when he reminded the association that people will go to stores, theaters, "bobber" shops, and other establishments and pleasantly await their turns for service, but are impatient and resort to criticism and abuse when telephone operators and lines are busy.

He also lit into the abuse of borrowing telephone service, and called for immediate action in eliminating this imposition so the present subscribers would not have to pay the inevitable penalty of higher rates.

The tangible value of association membership, too, was high-lighted in the presidential address. Self-defense and the necessity of getting adequate pay for good service were other topics featured by Mr. Barnhart.

Finances discussed.

Frank E. Bohn led the discussion on "Financing Telephone Properties; Adequate Rates, and Their Relation to Financing." He declared that no telephone company in a growing community these days could finance its growth from earnings, and that selling securities in small blocks to subscribers and employes, either for cash or on the installment plan, afforded the logical method of utility financing. Other prominent Indiana executives took an active part in the discussion, and mentioned the importance of correct accounting as vital to the success of financing plans.

Harry E. Eldridge of the Illinois Bell told the Indiana men that the whole future of the telephone business depends, to a great degree, on the relations with subscribers being friendly. He surveyed the face-to-face, voice-to-voice, and through-the-mail contacts telephone company employes had with the public and suggested methods for most successfully handling these contacts.

Professor H. C. Peffer, head of Purdue's School of Chemical Engineering, spoke of the investigation of "Electrolysis and Chemical Deterioration of Lead Sheath of Underground Cable, which was made by Professors Anderegg and Achatz of Purdue. The results of these investigations were presented in the September Issue of Telephone Engineer. In this connection, President Barnhart suggested that all of the state's telephone men get on the Purdue University mailing list to receive its bulletins pertaining to the telephone business.

Radio programs handled properly by a telephone company are in demand, according to the testimony of M. L. Clauser of Thorntown, whose company's reception and transmission to subscribers of radio programs had worked out well. Many requests were received from subscribers to make arrangements for the regular reception of radio programs. Legal difficulties presented the principal obstacle to handling these requests.

Difficulty of getting the right men to handle telephone properties in need of rehabilitation were recited by President F. B. MacKinnon of the national association, who spoke on the work of that body. Details of the association's services were given by Mr. MacKinnon, and further evidence of the national association's efforts for the telephone industry were related during the talk on the "Toll Reference and Text Book" issued by the association.

In view of the frequent references made to accounting during the progress of the convention, John W. Coffey's paper on this subject was received with considerable interest. The paper appears elsewhere in this issue.

Reports from the Indiana district associations and election of directors finished the convention's business. Five retiring directors were re-elected. They are: Max Hosea, Walter J. Uhl, W. L. Bott, John I. Cheney, and F. R. Strickler. Isom Ackerman was elected to the directorate to fill the unexpired term of S. M. Isom.

These foreign countries have all entrusted the development of their telephone systems to Government ownership, whereas in the United States the telephone business has been energetically developed by private initiative. Telephone systems operated by private enterprise now include 71 per cent of the world's total telephones; only 29 per cent being under government ownership. Canada, with 10.4 telephones per 100 persons and Denmark with 8.3, approach nearest to this country in number of telephones per 100 inhabitants.

In absolute numbers New York City, with 1,072,632 telephones on Jan. 1, 1923, was easily first among all the cities of the world. In fact, the American metropolis alone had more telephones than the whole of any foreign country except Germany. New York's telephone development of 18.2 telephones per 100 persons far exceeded that of Berlin, 9.3; Paris, 6.3, or London, 5.1.

Highest Saturation at Omaha

Omaha, Neb., leading the list, has twenty-eight telephones for every 100; San Francisco, 25.2; Minneapolis, 24.2; Denver, 23, and Washington, 22.8. The only important foreign city with a comparable telephone development was Stockholm with 25.4 telephones per 100 persons.

In most foreign countries telephone facilities are even more restricted in the smaller communities than in the large cities. Farmers' telephones are almost unknown in Europe. Telephone development has, in many countries, been concentrated principally in the capital cities and large commercial centers. More than one-third of all the British telephones, for example, are in London; more than one-third of all the French telephones are in Paris.

A certificate of incorporation has been issued to the Greene County Mutual Telephone Co. The incorporators are O. H. Vivell, F. A. Whiteside, B. C. Hodges, Henry Schafer, Sam Edwards, Dr. N. D. Vedder and S. E. Pierson, all of Carrollton, Ill.

The Kingman, Ill., Telephone Co. now owns and operates the Silver wood telephone system and he built a metallic line that will run to Covington and has started one that will run to Silverwood when completed. Prior Holland is president of the company and Scott E. Ratcliff is secretary and treasurer.

Fred D. Petty, Grafton, W. Va., has been appointed manager of the Chesapeake & Potomac in Fairmont, W. Va., succeeding M. W. Seabolt, transferred to the directory department in Baltimore, Md.

New York Handles a Tough Cable Job

New York, N. Y.—One of the most serious cable breaks that has been experienced on Long Island occurred when two large cables connecting the mainland with the seashore resorts on Rockaway peninsula went out of commission. The cause of the break was the filling of a large manhole containing six loading coil cases. Wet sand to the height of eighteen feet had been thrown around the manhole in the process of elevating the street and the downward pressure became great enough to cause an upheaval of the soil, crushing eight-inch supporting timbers around the manhole and tearing the half-ton loading pots from the cable to which they were spliced. Water then entered, causing the cables to go out.

The work of restoring service was hampered because of the inaccessibility of the location out in the marsh lands. The task of restoring service involved digging down through eighteen feet of new sand that filled the manhole and was delayed by the difficulty of keeping the manhole pumped out. Seven gasoline driven pumps were required to keep the hole from flooding while the work was going on. The dry ends of the cable were finally picked up and five reels of 300-pair emergency cable containing about 3,000 feet of cable were transported to the job on a cable barge.

Splicing of the emergency cable continued without interruption, in spite of heat and a severe thunder shower, until service was restored. In spite of the

(Continued from column 1, preceding page)

fact that every member of the repair gang worked continuously from sixteen to thirty-six hours, over five days were required before service was completely restored over the emergency cables.

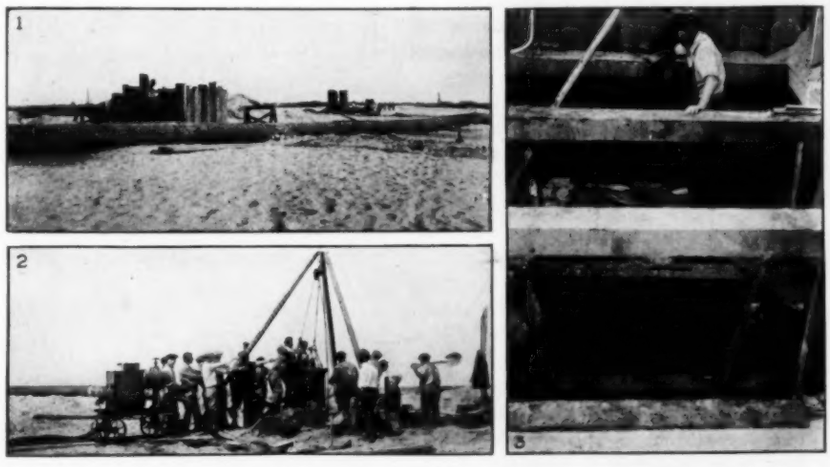
W. E. Fisher, secretary of the old Louisville (Ky.) Home Telephone Co., will be retained in an executive capacity by the Cumberland Telephone & Telegraph Co. under the consolidation, says General Manager L. K. Webb of the Cumberland company.

Ralph M. Dutcher, for 20 years with the Northwestern Bell Telephone Co., and for the past five years manager of the Howells and Clarkson (Neb.) exchanges, has taken charge of the Commercial Telephone Co., Belgrade, Minn., which he recently purchased.

W. A. James, manager of the Bell plant at Mt. Clemens, Mich., has been promoted to appraiser of the company's properties.

Samuel E. Fitting, supervisor of instruction for the Bell of Pennsylvania at Harrisburg, has been promoted to district superintendent of plant, Reading district.

Dublin, Ireland—Installation of automatic equipment has begun in the Dublin metropolitan area. Complete installation will take five years.



1—*The "locale" of the trouble on the Brooklyn-Rockaway cable. The sandy waste known as Riche's Meadow, where the city is doing some filling-in work was the scene of about 36 hours of intensive labor in repairing the damage caused by the bulging up of the mud under the loading pots in one of the manholes.*

2—*The loading pots were wrenched from the cables and submerged in mud and water when the weight of the sand around the manhole caused the mud to bulge up under the pots. The picture shows the repairman pulling up the second of the six loading pots that were put out of service.*

3—*Showing the cross-bracing and "shoring-in" of the troublesome manhole and the difficulties under which the men worked. The splice in the bottom foreground was made while the splicer stood almost waist-deep in mud.*

Improving the D. S. Route

Denial of Service Is Necessary for Slow-Paying Subscribers but May Have an Adverse Effect on Good Will—This Article Suggests How to Avoid Its Pitfalls

By JOHN M. WEVER

Prompt collection of the revenue from its services is essential if the operation of a telephone company is to be successful from a financial standpoint. To enforce prompt payment by subscribers many telephone companies have felt the necessity of some method of treatment that will give slow-paying subscribers effective notice of their delinquency. With many companies, this notice has taken the form of a refusal of the company to accept and complete outgoing calls from the telephone as long as payment for service is in arrears.

This practice, commonly termed "Denied Service" and frequently abbreviated to D. S., is a subject touched upon but little. Possibly this is because it comes into being but once a month and then drops out of the picture to be forgotten gladly by the other departments which feel its effects. The function of the commercial department is such, however, that it cannot lose sight of the practice for a single moment.

Unfortunately the application of a penalty of this kind for failure to pay promptly, not only affects the particular class of subscribers toward whom it is directed but it also affects other subscribers and the public generally. It also places a burden upon the people in the telephone organization who handle the practice which is not always pleasant. Notwithstanding these conditions, in many cases through lack of intelligent attention it has become merely a routine practice rather than a means by which a certain result can expediently be accomplished.

Improvement Is Desirable

Present day routines for the handling of denied service leave, generally speaking, a great deal to be desired. Perhaps the reason for this is because, as public service corporations, telephone companies have become so accustomed to thinking of the public as a whole, that they have neglected to consider the individual. Certainly, if there is to be any improvement in present day routine methods, it is the individual whom the company must consider rather than the body of subscribers as a whole.

Such a statement may seem to savor a bit of radicalism in advocating a departure from the usual standard practices, yet if you will stop to consider the matter you will agree that while existing methods, no doubt, are effective in accomplishing their primary purpose, it is with a great deal of wasted effort that the desired result is accomplished. At the same time, we must admit that the present method is effective and while it is very easy to condemn its shortcomings, it is difficult to suggest a more efficient alternative.

It must not be construed from the foregoing remarks that a routine can be set up which will be applicable to all telephone companies without variation. Magnitude of operations and company policy dictate the form it shall take, yet there are certain fundamentals common to all companies around which a successful routine can be formulated.

We can say, for instance, that the primary purpose of denied service is to improve "collections." That some means is necessary to bring in past-due revenues for service rendered is the basis upon which every denied service routine is founded. We meet there on common ground. We are still in accord when we agree that D. S. routine is a practical way by which to secure payments of past due accounts.

Beyond this point, however, magnitude and policy dictate what operations shall be incorporated in the routine. It is as useless to attempt to formulate a routine applicable to all companies as it is to assume that a rate scale can be made universal. Too many elements of plant, traffic and commercial practice enter into the proposition, and while these elements often constitute a common problem, each must be handled in a way compatible with the factors as found in the particular case.

The purpose of this paper is not, as might be supposed, an attempt to set forth what should or should not be incorporated in a D. S. routine, but rather an effort to extend a few suggestions resultant from close contact with a routine application, in the hope that some benefit and profit may be derived by those who feel that their own practices in this regard are capable of improvement. It must be remembered that while these observations may apply to some they will not apply to all, but each reader may apply as much of them as may be suitable for his particular conditions.

To begin, we may say that:

1. The inconvenience to the public as a result of a D. S. routine is largely felt by those subscribers on party or rural lines.

2. It is common knowledge among commercial people that a D. S. list is comprised of two elements—the unintentional, occasional offender and the "repeater."

3. The fact that certain subscribers are responsible for the regular interruption of service of others on party lines does not excuse the telephone company from remedying the condition.

4. A D. S. routine is capable of creating a large or small degree of ill will, depending upon the manner in which the routine is applied.

Annoyance Greatest on Party Lines

It is perhaps best for our purpose to consider first the inconvenience to the public and unoffending subscribers. Party and rural lines from an exchange serve the bulk of a company's subscribers, whether they be business or residential users, and aside from the effect of denied service on these lines, the majority of complaints of various sorts issue from the patrons of these lines.

Considering that this is the case, it might be well to review an assumed situation, which is by no means a theoretical case. Let us take for example ten four-party lines and consider the elements entering into their use, in order to determine what further effect the routine may produce.

Due to the complexity of a telephone system, various mechanical troubles arise at times, that cause the subscriber to complain of his service. Since the difficulty is purely mechanical we may pass it by without comment, other than to remark that it is an annoyance and has an indirect bearing on the effects of D. S.

A second element, not infrequent on party lines, arises from the fact that annoyances exist which are beyond the power of the company to correct. They are caused by subscribers, and include such things as extended periods of use of the circuit for social purposes, rudeness and the like. While the public realizes that such annoyances can in no way be laid to any fault of the company, nevertheless there remains that spark of discontent which an unpopular rule of the company may fan into a flame at any moment.

The result is that a party-line subscriber may constantly be on the defensive. Now if we apply a D. S. routine directed at one subscriber on each of the ten lines we have arbitrarily chosen for an example, it is obvious that there is a possibility of creating 30 dissatisfied patrons. Whether or not the prompt paying subscriber will have reason to complain of the situation depends on the method of applying the D. S. routine. Certainly it is to the best advantage of the company to eliminate, insofar as is practicable, all practices which may nullify its efforts to have every telephone subscriber a satisfied customer.

The Problem of the "Repeater"

Every denied service list is composed of two elements, the occasional and unintentional offender, and the habitual delinquent, or repeater. The former needs attention, to be sure, to a degree commensurate with his offense, but our main concern is with the repeater, for it is he who is a periodical nuisance to the remaining subscribers on his line. Keep in mind we are still considering party and rural lines, and right here let it be stated that we should be more concerned to correct such a condition on a four-party than a two-party line, and on a rural line than a four-party line. The reason is obvious, although we should not neglect the one because our attention is focused on the other.

The repeater can at once be classed with that few whose main ambition in life seems to be the gaining of something for nothing. He should be treated as such. One thing is certain, the repeater should be eliminated insofar as party and rural lines are concerned. If he must be tolerated, and there is no doubt but that he must, let him be in a position where he can annoy the company and not the public.

Hence our recommendations in the case of the repeater are these:

1. If a subscriber on a party or rural line makes his denial of service a repeated occurrence, let him be informed frankly that, because of others on his line we will be compelled, the next time he is denied service for non-payment, to disconnect his loop at the pole, in which case the execution of a new contract and a service connection charge of $1.50 will be necessary for the resumption of his service. It is important, however, that he understand that this is being done, *not as a penalty*, but because the company cannot afford to have the service of others impaired because of him. This to be effective without notice should his name again appear on the D. S. list.

2. Should such action be necessary, and the subscriber subsequently wish to have his service restored, it is essential that he also be made to pay his bill in full, and not only the bill rendered, before being permitted to execute the new contract and pay the service connection charge in advance.

3. If such an arrangement, following the disconnection, be not satisfactory to the subscriber and he refuse to pay the bill in full, leave him with the understanding that the telephone will be left on the premises for fifteen days, at the end of which time, if he does not restore his credit with the company and resume his service, the instrument will be removed, after which it will be necessary to charge him a standard service connection charge of $3.50 in order again to furnish him service.

4. If it finally becomes necessary to remove his telephone two things of importance have been accomplished—the elimination of a trouble-maker whose attitude is not compatible with that of the company, and the uninterrupted service of the others on his line.

5. There is another possibility for the commercial office. The service of many subscribers on denied service for the non-payment of an account is sometimes restored on the payment of the bill rendered. The result is that by the time D. S. comes around again, those subscribers who have paid the bill rendered only, are again placed on the list if they have not paid in time. By eliminating such a condition and making it necessary for them to pay their bill in full before restoring service, a practice is at once set up which will tend to reduce the list and, at the same time, tend to make the applications of the above suggested practice less numerous.

Duty of Company to Reduce Annoyance

Inasmuch as it is the telephone company who necessarily must make inquiries of calling subscribers on party lines in an effort to determine whether or not the calling party is on the D. S. list, those paid subscribers who are subjected to this treatment consider the company at fault rather than the delinquent for not devising some plan of action that will bring the latter to account without causing them a great deal of unnecessary trouble. It is evident that the telephone company should endeavor to reduce this annoyance to the minimum.

D. S. routine is a necessary evil, and is a potential factor in forming ill will by the very practices embodied in it. Sooner or later each part of a community is likely to come under the ban, and a company that does not reduce the detrimental effects of its routine to a minimum is defeating its own end.

The effort put forth in eliminating annoyances due to the neglectful attitude of the very few, will be more than rewarded, not only economically but also by the appreciation of a public whose service is not permitted to fall below a standard it has every right to expect.

Waco District Holds Lively Two-Day Meeting

Waco, Tex.—Good representation of telephone companies in the Waco district attended the two-day executive and traffic conference held here. President R. B. Still of the association made the keynote speech. Other bright features on the program were:

"Recording and Routing Calls," Miss Agnes Mandoiza, toll service observer, the Texas Long Distance Telephone company, Waco.

"Prompt Answer to Local and Toll Signals," H. B. Whatley, toll traffic supervisor, S. W. Bell Telephone company, Dallas.

"Proper Method of Handling Delayed Calls," Mrs. J. N. Hopper, chief operator, Gulf States Telephone company, Gatesville.

"Through Switching," F. C. Bookout, traffic chief, Southwestern Bell Telephone company, Cleburne.

D. S. Sharp, toll wire chief of the Texas Long Distance Telephone company, spoke on the subject, "Importance of Reporting Toll Wire Troubles."

"Handling of BY and DA Call Orders and WH Report Tickets," Miss Mollie Richardson, toll chief operator, Southwestern Bell Telephone company, Waco.

"Overlap Ringing," Miss Elma Ballard, toll chief operator, the Texas Telephone company, Waco.

"Selection and Training of Force," Miss M. E. Templin, local chief operator, the Texas Telephone company, Waco.

"Application of Different Classes of Toll Service and Report Charges," O. L. Ellis, traffic supervisor, Southwestern Bell Telephone Company, Fort Worth.

Runzel-Lenz Electrical Mfg. Co. Completes 20th Year

J. Mayo Lenz and W. L. Runzel have just rounded out their 20th year as the Runzel-Lenz Electric Mfg. Co. It has been a period of steady and substantial growth. From a small beginning has grown a world-wide trade and reputation for their telephone and switchboard cords, tinsel and copper conductor cords, silk and cotton insulated wire, and lead covered and braided silk and cotton cable. The original modest quarters have developed into one of Chicago's finest factories. The firm also enjoys a big business in the radio and automotive industries.

Terrell, Tex.—The Chisholm telephone line from this city has been purchased by the Terrell Chamber of Commerce.

Columbia, S. C.—The Island Telephone Co., of Meggetts, S. C., has been incorporated. D. Q. Towles is president.

Tells of "Happy Medium" Wire

Performance of Copper-Clad Wire and Characteristics of the Product Are Summarized—Method of Welding Copper and Steel—Aluminum Wire Data

By P. KERR HIGGINS

In addition to hard drawn copper there are other kinds of wire used in telephone work. The principal one is double galvanized iron wire which is used very extensively in short line and rural line work. The use of iron wire will be covered in a later article. Between copper wire and iron wire, there is a wide gap which remained unfilled until recent years when many efforts were made to find a happy medium between these two extremes. Many kinds were introduced under names such as "Monnot Copper-Clad Steel Wire," "Phono-Electric Wire" and the latest type known as "Copperweld." In addition to these, Phosphor Bronze has been tried out in this country, but does not seem to have become popular, although it is extensively used in Europe. "Phono-Electric Wire" had 33 per cent greater tensile strength than copper. The conductivity was 39 per cent that of copper wire. Phosphor Bronze has the same strength as "Phono Electric Wire," but the conductivity is only 26 per cent of copper.

Characteristics of Copper Clad Wire

Copper clad wire is designed to combine successfully the tensile strength of steel and the high conductivity of copper. The various kinds of copper clad or "copper weld" wire all consist of a steel core with a copper covering; in the latter the two metals being perfectly welded before the process of rolling and drawing.

This combination produces a telephone wire that will not rust, and which, in addition to having ample conductivity for many circuits, is much stronger than copper wire. Copper-clad was formerly manufactured by electrolytically depositing copper on steel wire, but this method produced only a thin porous coating of copper. The consequent high resistance and imperfect protection of the steel from the weather kept this type of wire from becoming popular.

The present copperclad or copperweld wire is manufactured by fusing or welding the copper coating to the undrawn steel billet which unites the copper exterior to the steel core. The weld is made by placing centrally a round steel billet within a cylindrical graphite mold of the proper inside diameter, leaving a uniform space around the steel billet. The graphite mold containing the steel billet is then moved into a furnace where it is heated until the surface of the steel is at the melting point. Molten copper is then poured from ladles into the mold, filling the space between the white hot steel billet and the inner wall of the mold. This insures a perfect molecular contact and forms an absolute homogeneous union. The copper coated billet is then rolled into rods and the rods are cold drawn into wire. The weld cannot be broken by bending, twisting, hammering or other mechanical force, and it is claimed that galvanic action cannot occur.

The proportions of copper and steel are regulated at the time the billets are made and the finished wire is made in two grades known as "30 per cent conductivity" and "40 per cent conductivity" as compared with copper wire of the same size. The present standard of copper clad or copperweld wire gives a tensile strength 50 per cent stronger than hard drawn copper or galvanized iron wire of equal size. See Table 5. To equal its strength would require 70 per cent greater weight of hard drawn copper or iron line wire. The elongation is about the same as steel under the same conditions.

Copper Clad Wire Used for Drop Wires

The most popular use of this wire in telephone work at the present time is in No. 17 gauge, duplex drop wire, which has proved to be very efficient. Copperweld is also made up into ground rods which are much superior to the ordinary galvanized iron rods. It is also manufactured for messenger and guy wires. Copperweld wire, etc., is manufactured by the Copperweld Steel Company, with offices in Chicago and the main office and mills at Braddock P. O., Rankin, Pa., from whom complete data can be had by those interested.

There has been much speculation as to the permanence of the weld between the copper and steel in copperweld and some are still doubtful in this regard. The writer has made many tests with this wire, but was never able to crack or separate the copper from the iron even with the use of a cold chisel. The skeptic has only to try for himself to demonstrate that this is a practical and an economical wire for most purposes in the telephone industry. Wherever the higher resistance may be disregarded, and where the higher tensile strength is needed this wire completely fills the bill. Since the weight and expansion is less and the tensile strength so very much greater, than copper it is suitable for use where long span construction is necessary. The following tables show the weight, tensile strength and ohmic resistance of copper clad wire as compared with extra BB iron galvanized wire and 98 per cent conductivity copper.

Basis of Comparison with Iron and Copper Wire

In comparing copper clad wire with copper and iron, the scrap value and interest on the original investment should be taken into account with the life of the different lines. The first cost too frequently decides questions against the judgment and recommendation of the engineer. Due to the reduced specific weight, a given weight of copper clad steel wire can be strung further than the same weight in copper of the same gauge. In replacing iron wire with copper-clad wire where the tensile strength is important, a lighter wire can be used as the original strength of the copper clad wire will be approximately the ultimate estimated strength of the iron wire after allowing for deterioration.

Until recent years, No. 14 B. & S. gauge copper wire was used extensively for drop wires from the pole line to the substation. At the present time no one thinks of using copper wire for this purpose as the copper clad has entirely replaced it. The higher conductivity of the No. 14 gauge copper is uncalled for, as the drop is connected to cable pairs using No. 19, 22 or 24 gauge wire. The only reason for its use was to increase the tensile strength as the spans had to be self-supporting. The No. 17 B. & S. gauge copper clad wire having 30% conductivity of copper has the same tensile strength of the No. 14 B. & S. hard drawn copper wire and approximately the same conductivity as the cable pairs. The result is that the amount of material is reduced to one-half and on account of the reduced area the amount of rubber insulation is decreased. The amount of braid covering is also considerably reduced. Thus the finished wire is very light, easy to handle and costs approximately 43% less than the No. 14 copper. Copper wire smaller than No. 14 NBS or No. 12 B. & S. gauge cannot

To-morrow's Telephones

So vital a factor has the telephone become in American life that the demand for it would undoubtedly grow even without increases in population. New businesses are founded; others expand. New homes are established in town and city, in suburban dwellings and apartment houses.

To meet the needs of America, to-day and to-morrow, with the best and cheapest telephone service, is the responsibility of the Bell System. The telephone will grow with the population and prosperity of the country, and the plans of to-day must anticipate the growth of to-morrow.

The service which is given to-day was anticipated and provision was made for it, long in advance. Money was provided, new developments were undertaken, construction work was carried through on a large scale. The Bell System, that is, the American Telephone and Telegraph Company and Associated Companies, has continuously met these requirements. It has enlisted the genius of technical development and the savings of investors for investment in plant construction.

Over 315,000 men and women are owners of the American Company's stock and over half a million are investors in the securities of the System. With a sound financial structure, a management which is reflected in a high quality of telephone service, the Bell System is enabled to serve the increasing requirements of the American public.

AMERICAN TELEPHONE AND TELEGRAPH COMPANY
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BELL SYSTEM
One Policy, One System, Universal Service

safely be used in spans because of its low tensile strength. The copper clad wire is durable as copper and since its strength lies on the inside rather than on the hardened outside shell, as in the case of copper, it is subject to a lesser number of breaks and can be very easily taken down and used elsewhere. As a general rule copper wire when taken down cannot be used again and is relegated to the junk pile due to nicked and scratched spots on the surface, for the reason that when the hard surface of copper is injured then the tensile strength is materially reduced.

Experience tells us that the use of No. 17 copper clad for drop wire has resulted in a saving of approximately $50.00 per mile due to the lessened weight of rubber and braid and the use of one-half of the weight of metal. If this statement is true then may it not also be true of open line wire with a more expended use of this bi-metal product. Some years ago the American Telephone & Telegraph company made comparative mechanical tests of No. 14 B. & S. copper wire and No. 17 B. & S. copper-clad wire with the results shown in the tables 1 and 2.

TABLE 1. COMPARATIVE MECHANICAL AND ELECTRICAL PROPERTIES.

	No. 14 B. & S. Copper Twisted Pair.	No. 17 B. & S. Copper Clad Twisted Pair.
Diameter of bare wire	.064 inch	.04526 inch
Diameter over braid	.196 inch	.15526 inch
Thickness of rubber insulation	.046 inch	.035 inch
Thickness of braid	.020 inch	.020 inch
Area of bare wire	4096 cir. mills	2025 cir. mills
Area of bare wire	.003216 sq. in.	.001616 sq. in.
Area of braid	.01154 sq. in.	.008576 sq. in.
Area of cross section one wire	.03017 sq. in.	.018869 sq. in.
Breaking weight single wire	190 lbs.	190 lbs
Breaking weight twisted wire	380 lbs.	380 lbs.
Weight per 1000 ft. single bare wire	12.4 lbs.	5.5 lbs.
Weight per mile single bare wire	65 lbs.	29 lbs.
Weight per foot twisted wire	.7428 lbs.	.03805 lbs.
Weight per 1000 ft. twisted pair	74.28 lbs.	38.05 lbs.
Weight per mile twisted pair	392 198 lbs.	200.904 lbs.
Resistance per thousand ft. 60° F.	2.485 ohms	16.760 ohms
Insulation resistance per mile (60° F.)	500 megohms	250 megohms
Dielectric strength of insulation	1500 volts	1000 volts

TABLE 2. SAFETY FACTOR.

Span in feet	100		200		300	
Sag in inches	18		42		60	
Kind of wire	No. 14	No. 17	No. 14	No. 17	No. 14	No. 17
Safety Factor (normal)	6.00	12.30	3.40	6.90	2.20	4.46
Safety Factor (loaded)	3.19	5.20	1.82	3.22	1.16	1.86
Percent reduction of safety factor	47	57	46	53	47	58

Inductance of Copper Clad Wire

Inductance of a wire arises from two elements, namely the magnetic field within the body of the wire and the magnetic field surrounding the wire. The latter forms a large percentage of the total inductance. Comparisons between two wires of equal diameter but different metal show the inductance due to the external field approximately the same for both with a uniform distribution of current through its cross section. The magnetic field within the wire is greatest at the surface and gradually diminishes to zero at the center of the wire. However in telephone transmission, the distribution of current is not uniform, but increases in density toward the surface of the wire where it reaches its maximum. Hence the elements of current flowing in a solid wire meet the maximum impedance if taken at the center of the wire and the minimum impedance if taken at the surface of the wire. This phenomena seems to develop an increase in resistance and a slight decrease in inductance, popularly known as "skin effect." Thus in copper clad wire, the iron core seems to increase the percentage of total current flowing in the copper skin over what would normally flow in a wire of the same cross section wholly of copper due to the greater inductance of the iron.

Use of Copper Clad Wire at Railroad Crossings

Copperweld wire has been highly recommended for railroad crossings or where the open wire is exposed to sulphurous or other fumes, on account of its resistance to corrosion and its greater tensile strength.

Selection of Proper Wire

The Copperweld Steel Company has made careful studies and analyses tending to show the most suitable kind and size of wire for the construction of new telephone wire circuits. In making these studies they have considered the three most important requirements, namely, Cost, Speech Transmission and Safety. By safety is meant that the wires will stand up and not break under normal loads. The results of their tests show that copperweld telephone wires have stood up when used on the same poles as copper and galvanized wires of equal and larger sizes which were broken down by the same storm. The following is a table given by the copperweld manufacturers showing the results of comparative safety. See Table No. 3.

The data in the table are based upon the use of new wire, but it must be remembered that iron wire after some years of exposure gets very rusty and even pitted, while copper wire after considerable use may have the skin damaged, all of which tends to materially reduce the breaking point of such wire. In the case of the copperweld wire its non-rusting qualities should be given consideration in comparing the ultimate cost with other wires.

In the case of existing pole leads, comparison of costs must be confined to the wires only and include such annual costs as maintenance, repairs, replacements, etc., in addition to the first cost of the wire. On planning a new circuit to be strung on telephone poles which already carry galvanized wire or hard drawn copper wires with apparent satisfaction, the selection of the size of copperweld can be made on the basis of similar strength and safety. In table 4, sizes of galvanized and copper telephone wires in the left column are shown opposite the size of copperweld wire, giving similar safety when strung on the same pole line. Table 5 shows some additional comparative figures for copper, iron and copperweld wire.

Transmission

The transmission of speech over copperweld wire is better than over iron wire. As shown in Table 6 the length of 40% copperweld wire for a given transmission equivalent is approximately double that of new iron wire of similar size. In old iron wires allowance should be made for a gradual loss of speech transmission efficiency due to the rusting of wires and joints, which does not have to be made for the copperweld wire.

Aluminum Wire

The use of aluminum wire in telephone work so far seems to have only reached an experimental stage. In these tests No. 10 wire was used, but the results were not altogether satisfactory. The tensile strength showed 513 lbs., number of twists in 6 inches 20, elongation 1-3 higher than copper. However, in electric light and high tension lines where stranded conductors were used, some-

TABLE 3. TABLE OF COMPARATIVE SAFETY OF COPPERWELD, COPPER AND NEW GALVANIZED TELEPHONE WIRES WHEN STRUNG ON SAME SPAN.*

Size and Kind of Bare Wire.	Weight per mile. Lbs.	Approximate Sleet and Wind Load on Wires Required to Break Them at 0° F. Lbs. per Lin. Ft.	Relative Factor of Safety Per Cent.
No. 10 Copperweld	154	2.58	100
No. 11 Copperweld	121	2.09	81
No. 9 Copper (hard-drawn)	209	1.84	71
No. 12 Copperweld	96	1.70	66
No. 10 Copper (hard-drawn)	166	1.47	57
No. 9 E. B. B. Galvanized	314	1.45	56
No. 10 E. B. B. Galvanized	258	1.20	47
No. 12 E. B. B. Galvanized	170	.79	31

*All the above wires are assumed to be strung on a 100-foot span and each wire sagged 1 foot at 60° Fahr. Each wire is assumed to retain modulus of elasticity up to breaking point.

"COPPERWELD"

(MADE BY THE MOLTEN WELDING PROCESS)

for

TELEPHONE SYSTEMS

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TWISTED PAIR
MESSENGER WIRE
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In Canada—Northern Electric Co., Ltd.

Agents throughout the World

times with steel core, the results were very satisfactory.

The great difficulty in uniting two pieces of aluminum is a factor which limits its use. This difficulty is due to the fact that at the point of soldering an extremely thin film of alumina is formed which resists the union of the metal with the solder in question. The use of a solder gives the best results, the autogenous process not being so reliable. Some forty different solders are known. Many authorities recommend that the article be first tinned with an alloy of one part aluminum to five parts tin. Others advocate that the same alloy be then used as a solder. Among the solders that are highly recommended are the following:

Five parts zinc, two parts tin, one part lead.

Nine parts zinc, one hundred parts tin, one hundred and sixty-five parts lead.

Forty-six parts zinc, two parts tin, fifty-two parts copper.

Ten parts zinc, one hundred parts tin, twenty parts silver, one to six parts aluminum.

Seventy parts aluminum, twenty parts tin, ten parts copper or silver.

Thirty parts aluminum, twenty parts copper, fifty parts zinc.

Twelve parts aluminum, eight parts copper, eighty parts zinc.

Six parts aluminum, four parts copper, ninety parts zinc.

Five parts zinc, ninety-five parts tin. With the last five, the surfaces should be first tinned. The use of a good flux such as borax is generally desirable.

Quite a number of solders and processes that are trade secrets are now being exploited on the market, some of these being quite satisfactory.

TABLE 4. SIZES OF E. B. B. GALVANIZED AND HARD DRAWN COPPER WIRES CORRESPONDING WITH COPPERWELD TELEPHONE WIRE ON BASIS OF SIMILAR MECHANICAL SAFETY.

Present Size and Kind of Wire on Poles:	Size of Copperweld Wire for New Circuit:*
No. 8 E. B. B. Galvanized (Weight 390 lbs. per mile)	No. 11 Copperweld (Weight 121 lbs. per mile)
No. 9 E. B. B. Galvanized (Weight 314 lbs. per mile)	No. 12 Copperweld (Weight 96 lbs. per mile)
No. 10 E. B. B. Galvanized (Weight 258 lbs. per mile)	No. 12 Copperweld (Weight 96 lbs. per mile)
No. 12 E. B. B. Galvanized (Weight 170 lbs. per mile)	No. 12 Copperweld (Weight 96 lbs. per mile)
No. 9 Hard-drawn Copper (Weight 209 lbs. per mile)	No. 11 Copperweld (Weight 121 lbs. per mile)
No. 10 Hard-drawn Copper (Weight 166 lbs. per mile)	No. 12 Copperweld (Weight 96 lbs. per mile)

*Each of the copperweld wires in this table has greater safety than the galvanized or copper which is shown opposite it. The figures in parentheses are the weights of the wires in pounds per mile.

TABLE 5. COMPARATIVE WIRE TABLE—BARE AND WEATHERPROOF LINE WIRES.

Gauge No.	Diameter (Inch).	Breaking Load in Pounds.	Resistance in Ohms per Mile at 68° F.			Approximate Weight in Pounds per Mile.					
			COPPERWELD AND HARD-DRAWN COPPER.					Double Braid Weatherproof		Triple Braid Weatherproof	
			Copperweld			Bare					
A. W. G. (B. & S.)	Diameter.	Copperweld.	30% Conductivity.	40% Conductivity.	Copper.	Copperweld.	Copper.	Copperweld.	Copper.	Copperweld.	Copper.
4	.204	2650	4.46	3.24	1.34	615	665	747	799	815	867
5	.182	2200	5.60	4.23	1.69	485	528	602	647	665	709
6	.162	1800	7.08	5.33	2.13	385	420	494	529	555	590
7	.144	1450	8.92	6.71	2.68	308	333	405	430	460	485
8	.128	1200	11.3	8.45	3.38	242	264	327	349	374	396
9	.114	970	14.2	10.7	4.27	195	209	268	283	311	325
10	.102	800	17.9	13.5	5.39	154	166	229	241	268	280
11	.091	645	22.6	16.9	6.81	121	131	186	196	216	226
12	.081	520	28.5	21.4	8.56	96	105	150	158	178	186

		B. B. AND E. B. B. GALVANIZED.*				
B. W. G.	Diameter.	B. B.	E. B. B.	Bare.	D. B. W. P.	T. B. W. P.
4	.238	2271	2028	811	860	940
6	.203	1652	1475	590	665	740
8	.165	1092	975	390	470	525
9	.148	879	785	314	400	450
10	.134	722	645	258	350	400
12	.109	476	425	170	225	260
14	.083	277	247	99	145	175

*Taken from Manufacturer's Catalog.

TABLE 6. COMPARATIVE TABLE OF SPEECH TRANSMISSION EQUIVALENTS SHOWING APPROXIMATE LENGTH OF COPPERWELD AND GALVANIZED OPEN WIRE LINES WHICH HAVE SPEECH TRANSMISSION EQUIVALENT TO 32 MILES OF NO. 19 STANDARD CABLE (METALLIC).

Size Wire.			Speech Transmission Equivalent.	
A. W. G. (B. & S.)	B. W. G.	Diam. (In.).	Copperweld 40% Conductivity.	E. B. B. Galvanized (New).
	8	.165		145 Miles
6		.162	390 Miles	
	10	.134		125 Miles
8		.128	271 Miles	
9		.114	228 Miles	
	12	.109		100 Miles
10		.102	193 Miles	
12		.081	141 Miles	

(From report of F. F. Fowle)

The speech transmission equivalents of 30% conductivity Copperweld wires are approximately three-fourths of those shown for 40% conductivity Copperweld wires of equal size.

Additional Data on Wire Gauges

It is unfortunate in telephone practice that there is so much confusion caused by a multiplicity of wire gauges and to add to this confusion several of them are known by various names. Some of these facts were brought out in a previous article and the following is additional thereto.

Brown & Sharpe (B. & S.)=American Wire Gauge (A. W. G.)

New British Standard (N. B. S.)= British Imperial, English Legal Standard and Standard Wire Gauge and is variously abbreviated by S. W. G. and I. W. G.

TABLE 7. TABULAR COMPARISON OF WIRE GAUGES.
(Bureau of Standards.)

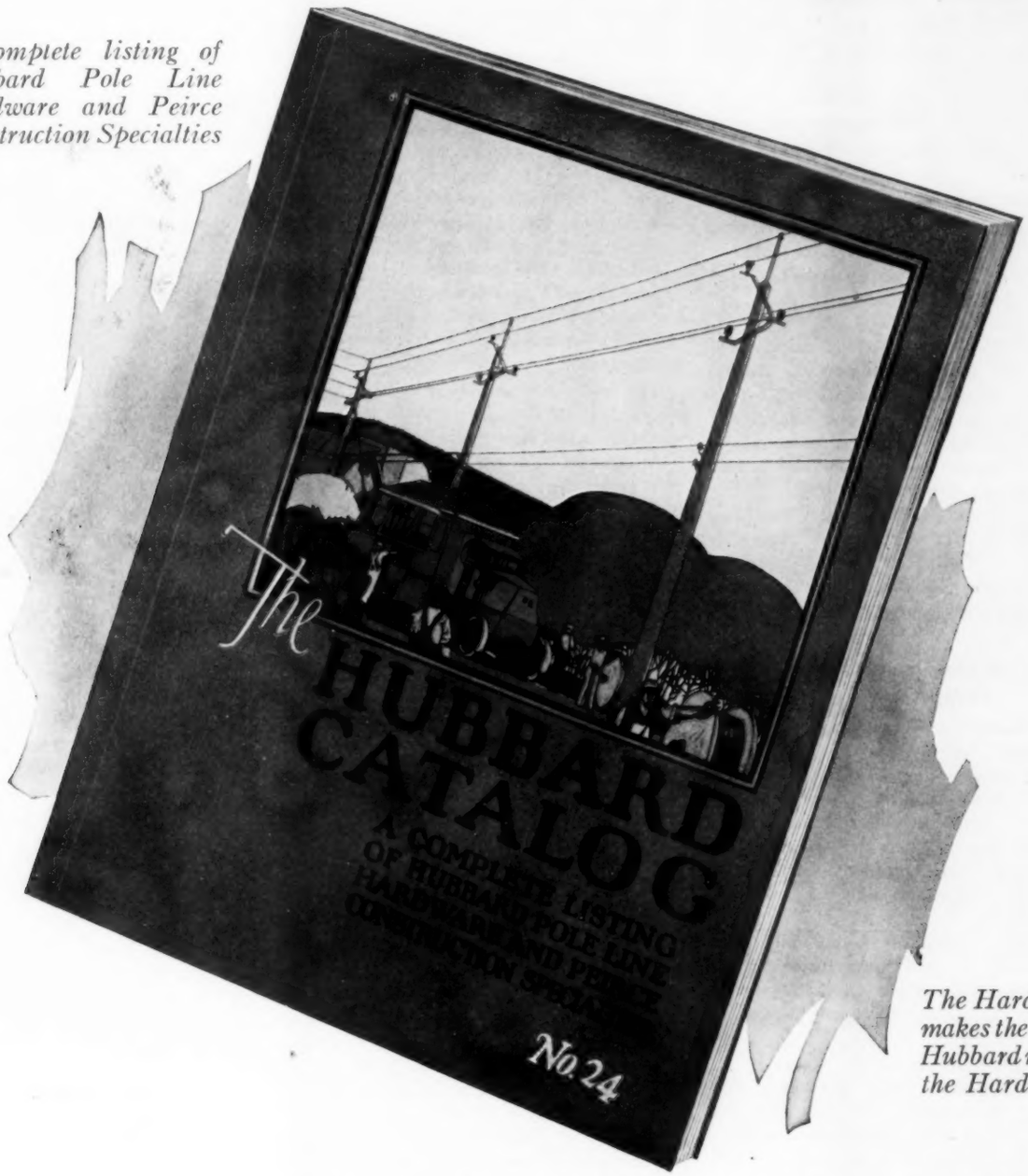
Gauge No.	American Wire Gauge (B. & S.)* (Diam. in Mils).	American Wire Gauge (B. & S.) (Diam. in mm.).	Steel Wire Gauge† (Diam. in Mils).	Birmingham Wire Gauge (Stubs') (Diam. in Mils).	Old English Wire Gauge (London) (Diam. in Mils).	Stubs' Steel Wire Gauge (Diam. in Mils).	(New) (British) Standard Wire Gauge (N. B. S.) (Diam. in Mils).	Gauge No.
0000	460.	11.7	393.8	454.	454.	....	400.	0000
000	410.	10.4	362.5	425.	425.	....	372.	000
00	365.	9.3	331.0	380.	380.	....	348.	00
0	325.	8.3	306.5	340.	340.	....	324.	0
1	289.	7.3	283.0	300.	300.	227.	300.	1
2	258.	6.5	262.5	284.	284.	219.	276.	2
3	229.	5.8	243.7	259.	259.	212.	252.	3
4	204.	5.2	225.3	238.	238.	207.	232.	4
5	182.	4.6	207.0	220.	220.	204.	212.	5
6	162.	4.1	192.0	203.	203.	201.	192.	6
7	144.	3.7	177.0	180.	180.	199.	176.	7
8	128.	3.3	162.0	165.	165.	197.	160.	8
9	114.	2.91	148.3	148.	148.	194.	144.	9
10	102.	2.59	135.0	134.	134.	191.	128.	10
11	91.	2.30	120.5	120.	120.	188.	116.	11
12	81.	2.05	105.5	109.	109.	185.	104.	12
13	72.	1.83	91.5	95.	95.	182.	92.	13
14	64.	1.63	80.0	83.	83.	180.	80.	14
15	57.	1.45	72.0	72.	72.	178.	72.	15
16	51.	1.29	62.5	65.	65.	175.	64.	16
17	45.	1.15	54.0	58.	58.	172.	56.	17

*The American Wire Gauge sizes have been rounded off to about the usual limits of commercial accuracy.

†The Steel Wire Gauge is the same gauge which has been known by the various names: "Washburn and Moen," "Roebling," "American Steel and Wire Co." Its abbreviation should be written "Stl. W. G.," to distinguish it from "S. W. G.," the usual abbreviation for the (British) Standard Wire Gauge.

Your Copy of the Reference Book on Line Construction Is Now Ready

A complete listing of Hubbard Pole Line Hardware and Peirce Construction Specialties



The Hardware makes the Line. Hubbard makes the Hardware.

The new Hubbard catalog No. 24 gives a complete listing of Pole Line Hardware and Peirce Construction Specialties for Transmission, Primary and Secondary Distribution, Street Railway, Telephone and Telegraph and Railway Signal work.

Every piece of Hubbard Hardware and Peirce Specialties is made from new rolled open hearth steel which has a tensile strength of from 55,000 to 65,000 pounds per square inch and is galvanized by the double-dip hot process.

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Write for it today

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In Canada: N. Slater Co., Ltd., Hamilton, Ont.

Birmingham Gauge (B. W. G.)= Stubs', Old English Standard and Iron Wire Gauge.

Roebling=Washburn Moen, American Steel and Wire Co.'s Iron Wire Gauge.

London=Old English (not Old English Standard). A tabular comparison of the various gauges is shown in Table 8.

The following is a list of the uses of the various gauges:

American Screw Co.'s Wire Gauge.—Numbered sizes of machine and wood screws, particularly up to No. 14 (.2421 inch).

Stubs' Steel Wire Gauge.—Drill rod.

Roebling & Trenton.—Iron and steel wire. Telephone and telegraph wire.

N. B. S.—Hard drawn copper. Telegraph and telephone wire.

London Gauge.—Brass wire.

B. & S. G.—All forms of round wires used for electrical conductors. Sheet, copper, brass and German silver. This gauge is standard for copper wire and is understood to apply to all cases where size of copper wire is mentioned in any wire gauge number.

U. S. S. G.—Sheet iron and steel. Legalized by Act of Congress March 3, 1893.

B. W. G.—Galvanized Iron Wire. Norway iron wire.

New Anglo-Dutch Submarine Telephone Cable

A description of the new submarine telephone cable which has just been placed between Domberg, Walcheren on the Dutch coast and Aldeburgh, Suffolk, England, appeared in a recent number of the Electrical Review of London. The new cable is of the paper insulated type and was designed to meet the following conditions:

Length of cable, 86 nautical miles.

Number of conductors, 16, consisting of 4 sets of quadruple cores.

Each conductor continuously loaded with iron wire.

Dry paper insulation.

Two separate lead coverings, with bituminous compound between them.

Armouring of galvanized steel wires.

Attenuation constant (β) per nautical mile at 800 cycles per second ($2\pi f = 5{,}000$) of each circuit not to exceed 0.02.

Interference between circuits as measured on the standard cross-talk meter, using actual speech cross-talk between physical circuits, not to exceed 400 millionths (equivalent to 75 miles of standard cable or a βl of 7.8).

Overhearing between a physical circuit and its associated phantom circuit not to exceed 4,000 millionths (equivalent to 52 miles of standard cable or a βl of 5.5).

The cable is of the continuous loaded type, a spiral of iron wire around the conductors furnishing the additional inductance. Special machinery had to be constructed to manufacture the cable and an unusual feature was the application of the sheath in 10 mile lengths, thereby reducing the number of splices materially.

On completion the 10-mile lengths were spliced together and transferred to the cable-laying vessel, the actual electrical tests obtained being as follows: Electrical constants of each physical circuit in the cable per nautical mile loop at a temperature of 60 deg. F. and a frequency of 800 cycles per second—

Resistance—16.12 standard ohms.

Capacity—0.11 microfarad.

Inductance—19.3 millihenries.

Leakance—2.8 micromhos.

Characteristic impedance (Zo)—422 ohms with phase angle 4 deg. 50 min. downwards.

The impedance is very uniform; between $2\pi f = 2{,}000$ and $2\pi f = 12{,}500$ the variation is less than $\pm 2\frac{1}{2}$ per cent.

Attenuation (β) per nautical mile at 800 cycles per second ($2\pi f = 5{,}000$) 0.0199.

In the same quad, maximum cross-talk, 200 millionths (equivalent to about 80 miles of standard cable, or a βl of 8.5).

Maximum overhearing, 2,000 millionths (equivalent to about 60 miles of standard cable, or a βl of 6.2).

Between quads, phantom to phantom, maximum 70 millionths (equivalent to 90 miles of standard cable or a βl of 9.5).

In respect of the cross-talk and overhearing tests, which were regarded as the most difficult conditions to meet, the actual values are far better than the stipulated requirements; in fact, the makers consider that the cable is probably superior to any hitherto made for long-distance telephony, and justifies the very special measures taken to ensure the production of a cable capable of fulfilling the difficult conditions imposed.

The s. s. *Faraday* sailed from Woolwich with the cable, which weighed 2,150 tons, for the laying operations which commenced at Domburg, Walcheren, on the Dutch coast, and were completed at Aldeburgh, Suffolk, on August 29th. The cable was laid and both ends were landed without the necessity of making a joint ("final splice") during the expedition, which is a very unusual performance and only possible in favorable weather.

Picot Made Monarch's Ohio Representative

Chicago, Ill.—P. L. Picot has been appointed sales representative for the Monarch Telephone Mfg. Co., Ohio territory, and will have his headquarters at 852 Neal avenue, Columbus.

Picot is one of the bright stars in the Independent selling constellation, and has been with the Monarch for the past six years. For nine years prior to his Monarch connection he was with operating companies in Indianapolis and Louisville. For three years he was Monarch's salesman in Missouri and Kansas and for

P. L. Picot

three years he has been in charge of the advertising and the sales correspondence for the company.

In his fine command of the problems of selling and using telephone equipment and in his straight-shooting, pleasing personality, Picot is a man that the Ohio telephone fraternity will welcome to its midst.

Mueller Making New Universal Test Clip

Cleveland, O.—Mueller Electric Company has introduced to the telephone market the No. 51 Universal test clip, which was particularly designed for use by telephone trouble men. The clip is fitted

New Universal Test Clip

with a needle which pierces the insulation and makes contact with the conductor. A V-shaped groove on the jaw opposite the needle serves to center the wire so the needle is sure to hit the conductor. The spring needles are easily renewed.

Urbana, Ill.—The Champaign Co., Urbana, has been incorporated with a capital of $10,000 by J. C. Powers, A. C. Neff, R. H. Murphey, E. E. Cheney and I. N. Kenyon.

MR. OPERATOR:—

MAKE YOUR HEADQUARTERS AT OUR HEADQUARTERS, ROOM 106, DURING THE UNITED STATES INDEPENDENT TELEPHONE MEETING AT THE SHERMAN HOTEL, CHICAGO. OCTOBER 21, 22, 23, 24, 1924.

Reliable Electric Company

3145 Carroll Avenue Chicago, Illinois

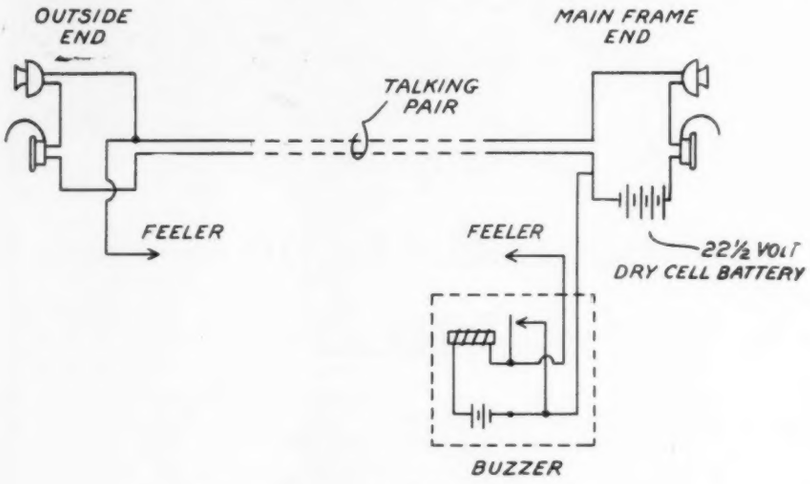
MANUFACTURERS'

Telephone—Switchboard—Cable Protection

LINE AND DESK

A NEW STUNT IN TAGGING CABLE

In tagging cable, difficulty sometimes occurs due to ground on the positive side of the common battery, especially when it is desired to have a continuous talking wire. A scheme which I have worked out eliminates this trouble by the use of a 22½-volt battery such as is used as a B battery on radio receiving sets. The arrangement is shown in the sketch. A talking pair is picked up and the head telephone sets are connected with the



Wiring Diagram for Cable Tagging Idea

22½-volt battery furnishing talking current. Next the tone is attached to one side of the talking pair and the other side to the feeler used at the main frame. The feeler at the main frame is then grounded and the man at the outside end grounds his feeler wire and connects the end to the side of the cable pair that gives the tone. The grounds at the main frame and at the outside end are removed and the set is ready for use.

In picking up the pairs, the man outside connects the feeler to one side of a pair and the man in the office tests over the main frame terminals until he finds the tone. This indicates that the wire is good. The tester at the frame then touches his feeler wire to ground. If the wire is grounded he gets a tone, but if the wire is clear he gets no tone. The other wire of the pair is then tested in the same way and if good, the pair is tagged and the next pair picked up and tested. The 4 inch by 7 inch by 3 inch block of dry cells is best for this purpose and such a block will last several weeks in ordinary use.—Contributed by Frank C. Morrill.

ANOTHER CASE OF JOINT TOLL LINE TROUBLE

The story in TELEPHONE ENGINEER of a case of trouble in a joint toll line reminds me of a case in which both exchanges had to take part of the blame. We had a case of noise from a power line due to a single phase section of line from a town about 8 miles away. This made both metallic and grounded lines very noisy. After the power line was cleared by installing a transformer at the start of the single phase line, a metallic toll line was still noisy. I went over the line as far as our end went and had it all in good shape. This did not clear the noise and we finally had a voltmeter test made. The test showed that the line was grounded inside our office and also out on the line. The ground in the office was finally located in the drop coil which was grounded on the frame and since the board was of an old type only one side was cut off when the plug was put in, and the noise continued during talking.

We then called the man at the other exchange and asked him to open his line at the office. It was still grounded. He then went to the junction pole between the two sections and opened the line. The test showed a ground on his part of the line and he went back over it. In a half hour the line was clear and when both grounds were off was perfectly quiet. We might have argued for a week that the trouble was on the other half of the line and both would have been right. When we got together and made a real test we found the trouble and cleared up the line in a short time.—Contributed by Henry Turnpaugh.

A TROUBLESOME INTERMITTENT CASE.—AND A CALL FOR HELP

A lineman of an Indiana company proposes the following case of trouble with which he has had a great deal of difficulty. "We have a subscriber who can ring the central office but when the operator answers can not be heard until the operator rings back on the line. After she rings everything works all right until the next call when the trouble comes in again. I have gone over the line and instrument but have not been able to locate the trouble as it does not stay in when I am testing."

This is a case of trouble that every telephone repairman meets sooner or later. It is due to a high resistance connection somewhere in the circuit which is broken down by the ringing current but does not permit the weaker talking current to pass. The remedy in most cases is to make a thorough inspection of the line and instrument, soldering all doubtful looking connections and overhauling things generally. Often this clears the trouble and the exact place where it was occurring is never known. Tests with a magneto test set are useless as the ringing clears the trouble temporarily. If the trouble will stay in for a period, a voltmeter test may be of some assistance, the voltmeter test being made with the line short circuited at various points. Another way of testing which has been used successfully in some cases is by using a battery and receiver. At an opportune time when the line is open, it is disconnected at the distributing frame and a battery of a few volts is connected across the line at the frame. The tester then goes over the line with his receiver to see if he can get the battery click at various points. If care is taken not to disturb the wires the trouble may stay in long enough to be located. Perhaps some of our readers have pet methods of making tests for this kind of trouble. We have

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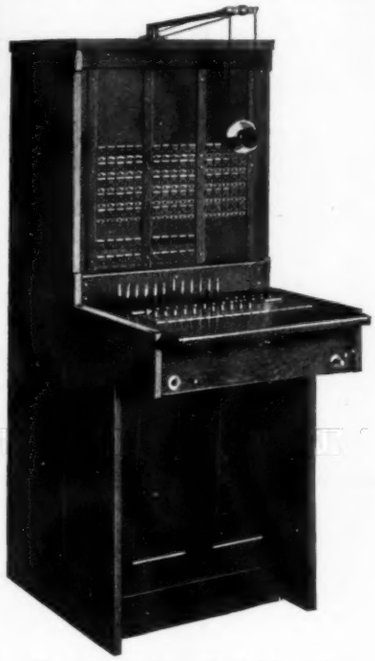
LEICH offers distinctive features in switchboard operation, and exclusive ringing equipment. Look these features over carefully at the NATIONAL CONVENTION. Improvements mean better and more economical operation of central office equipment.



No. 1 B 150 Line Switchboard

LEICH SWITCHBOARDS

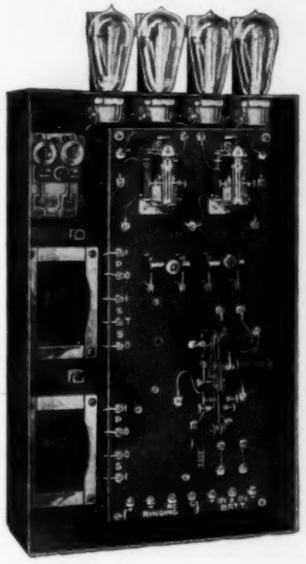
Double Lamp Supervision.

Lamps and restoring feature operate from alternating power current.

Lamps light on subscribers' disconnect signals, momentarily put out, then relighted on recalls.

Operators control restoring circuit from listening key.

The most economical and convenient system of double lamp supervision devised. Practical for all sizes of switchboards from 50 lines up to and including magneto multiple switchboards.



No. 121 Combined Charging and Ringing Converter

MULTIPLE TYPE

Leich Magneto Multiple Type Switchboards are equipped with the fundamental features that are conducive to maximum operating speed.

Call distribution, busy test, lamp supervision, the important features that mean convenience in operation, are incorporated in this switchboard. With this type of switchboard a magneto plant can be operated profitably on magneto rates.

LEICH RINGING MACHINES

Frequency Converter.

The 7-A frequency converter remains supreme as the most economical type of ringing machine to operate. Total cost for current 75 cents or less per month.

Combined ringing and charging machines
—Provide uninterrupted ringing current
—Provide economical ringing current
—Provide talking current very cheaply.

One machine charges storage batteries and produces ringing current. Unit equipment convenient to install and maintain. See us at the Sherman, rooms 116-117, Oct. 21st to 24th.

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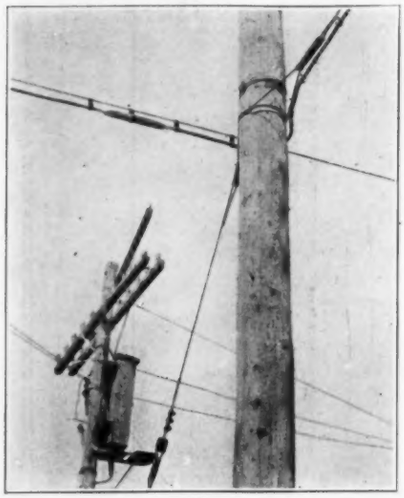
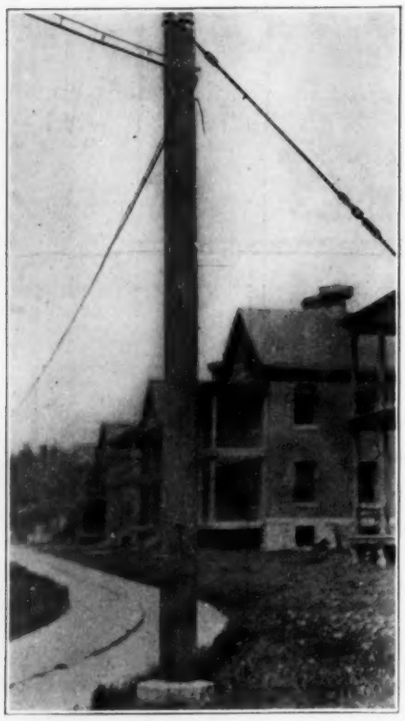
received help from the field on other cases. Perhaps some one will help us in this one. We know our querist and many others will be glad to receive suggestions. —Staff Contribution.

INSULATORS IN GUY WIRES AGAIN

In a recent number, a query was answered concerning the use of insulators in guy wires. Ray Blain, telephone plant engineer, of Omaha, Nebr., sends us some



pictures that illustrate such use. The presence of the power wires above the telephone cable will be noted as well as



the position of the insulators. There are some other features to which attention may also be called, particularly the separation of the guy strand from the messenger, the neat manner in which the cable is dressed around the corner poles and the secure lashing of the cable splice in one of the pictures.

NEAT CAREFUL INSTALLER IS AN ASSET

Personal appearance of the Plant man greatly influences the opinion in which our subscribers, the people with whom he daily comes into contact, hold our company.

The installer, for instance, should keep his personal appearance as tidy as possible, as cleanliness makes a very good impression on a future subscriber. Keep clean shaven, hands and face clean, clothes as clean and neat as possible. I don't mean by that that he should be dressed in a seventy-five dollar suit, a white snowdrift, and flowing silk necktie. Not at all. If he wears patched clothes, remember patches are no disgrace as long as the clothing is neat and clean.

An installer's work is such that he runs into dirt, which cannot be avoided, but he doesn't necessarily have to let the dirt remain on his person, because water is free and soap costs very little.

Now, we will take a trip around with an installer and see what takes place on the job. First, he receives his orders from the city foreman in the morning, and before calling and notifying the testman of the orders on which he is going he reads them very carefully. But why does he do that? For instance, here's one that reads "Work to be done in P. M." Well, let's say he goes out there in the forenoon and finds no one home. He notes the words "Work to be done in P. M." then, and knows the reason for them. There is all that time wasted and moments are so golden.

So our installer, in place of wasting all that precious time, reads his orders over very carefully in the morning and eliminates such mistakes. He realizes that his time is valuable to the company.

After notifying the testman, the installer shoulders his tools and proceeds to the address given on the order. When the bell is answered, the installer removes his hat and asks if Mrs. Smith or Mrs. Brown is in. Upon receiving an affirmative answer he states he is there to put in the telephone. The majority of subscribers are very pleasant and welcome him.

Perhaps Mrs. Smith hasn't fully decided on a good location for the telephone. She is undecided whether to have it in the dining room or the living room. So the installer makes a survey of the premises and offers a suggestion or two, helping Mrs. Smith to decide the location.

Continuing his campaign of neatness, the installer spreads a newspaper on the

Red Devil Tools Better Made

"Red Devil" No. 1950

--The Electrician's Staunchest Friend

Sizes: 6, 7, 8 and 9 inches

THERE'S no plier like "Red Devil" Electrician's Side Cutter No. 1950.

Backed by over a quarter century's fine tool making experience, it sets an example of the quality that is typical of all "Red Devil" tools.

The lineman's favorite, because it reflects full credit on his work.

Send for the "Red Devil" Mechanic's Tool Booklet.

SMITH & HEMENWAY CO., Inc.
Mfrs. of "Red Devil" Tools
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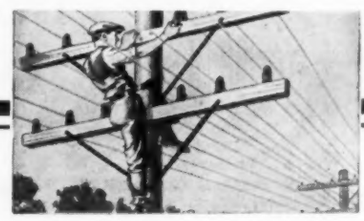

Twenty years of working with you

Many of the telephone men who will attend the Independent convention will remember when Runzel-Lenz started operations as telephone cord specialists in 1904.

From the first day of our company's history we have kept in closest contact with the telephone men who are Runzel-Lenz cord users so the product would reflect an intimate knowledge of actual operating conditions.

Cords are sources of much satisfaction, if they are absolutely right—or of so much grief, if one detail is wrong—that good telephone men very properly pay considerable attention to their selection.

This importance of cords gave us the golden opportunity to prosper by making cords that are conspicuously more durable, and free from the effects of moisture or the other causes that run up complaints and costs.

Runzel-Lenz make cords that embody the ideas and requirements of their users, more than any other cords on the world's market, and that have to the utmost degree, all of the features of construction twenty years' experience as cord making specialists, have revealed to us.

You are cordially invited to visit us at our U. S. Independent convention exhibit—Room 119—and go into detail with us on any phase of cord construction and service.

Runzel-Lenz Electric Mfg. Co.

1751 N. Western Avenue
CHICAGO, ILL.

floor where he is to work to catch the dirt and litter. Then he bores the hole in the wall for the wires, if necessary, and "fishes" the wire up through the floor and places the instrument on the wall.

Going to the basement, he finishes his work there, being careful to adhere to specifications in everything, and then goes back to the telephone to get a final test on the line, in order to see that it is working properly. Then he carefully cleans up any dirt and prepares to leave. All this he does in a quiet, orderly manner. As he goes, he informs the subscriber as to the method of operating the instrument, the number, and the like, thanks her and departs.

In my opinion, the installing of a telephone, completed in a neat and efficient manner, represents some of the best advertising our company can get and it no doubt leaves a favorable impression, especially on the new subscriber.—Jay McTaggart in The Mouthpiece.

LOOK OUT FOR LIVE WIRE

Herewith is a poster used by the Line Lines Department of the A. T. & T. Co. as a constant reminder that all foreign wires must be treated as dangerous.

Why not post some such warning, conspicuously, to protect *your* men?

J. S. McCulloh President of New York Telephone Co.

New York, N. Y.—Directors of the New York Telephone Company have accepted the resignation of Howard F. Thurber as president and have elected as his successor James S. McCulloh who had been operating vice-president since August, 1923. Mr. Thurber will continue in active telephone work as chairman of the board of directors. He has been connected with the company for 35 years and was elected president in October, 1919.

Mr. McCulloh is 56 years old. He was born and educated in Englewood, N. J., and began his business career in 1885 as a clerk in the West Shore Railroad. He gained knowledge of the telephone and telegraph in the joint operating headquarters of the railroad and the Western Union Telegraph Co., and in 1893 entered the employ of the American Telephone and Telegraph Company in the Long Lines Department, where he engaged in central office operating and maintenance work. After serving as a division superintendent in the middle west and in New England Mr. McCulloh was transferred in 1903 to the New York Telephone Company where he became superintendent of buildings and insurance. He was appointed general contract agent in 1908 and, the same year, when the company took over the New York and New Jersey Telephone Co. and five other Bell companies in New York state, his title was changed to general commercial superintendent. He was elected vice-president in charge of commercial work and public relations in 1919, and in August, 1923, his duties were further enlarged by his election as operating vice-president.

INTRODUCING

NO SCREW, BOLT, SCREW DRIVER or WRENCH REQUIRED to INSTALL; JUST a DRILL and HAMMER

Actual Demonstration at Booth No. 14

INDEPENDENT TELEPHONE ASSOCIATION CONVENTION

CHICAGO, OCTOBER 21, 22, 23, 24, 1924

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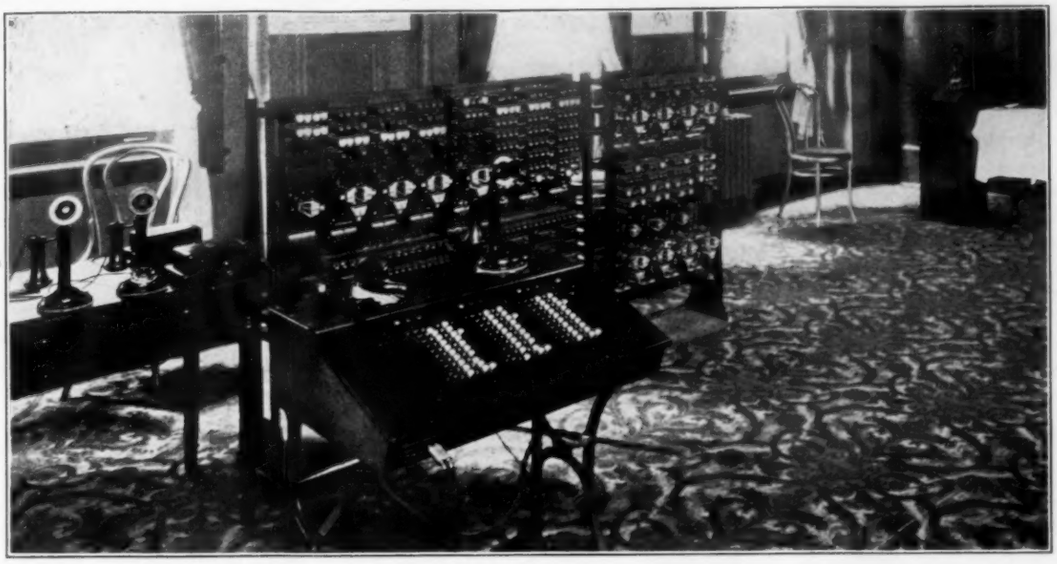
147 Cedar St. STAR EXPANSION BOLT CO. NEW YORK



AUTOMATIC SWITCHBOARDS

WITH

Key Control by Operators

OR

Dial Control by Subscribers

At the

NATIONAL CONVENTION

Rooms 111 and 112

HOTEL SHERMAN

CHICAGO

The NORTH ELECTRIC MANUFACTURING COMPANY

GALION, OHIO

The North line offers every kind of automatic telephone service, including the Automanual System for local and toll service, Automanual Central Control of outlying exchanges and Dial Automatic for both private exchanges and central office equipment.

SINCE
1884

New Illinois Bell District, J. H. Conrath Manager

J. H. Conrath, for some years commercial manager for the Illinois Bell Telephone Co. at Elgin, Ill., has been made district manager for exchanges in Lake, Kane, McHenry, Dupage and Cook counties, Illinois. His territory will be arranged in two divisions, one under W. N. Nish, assistant commercial manager at Elgin; the other under G. L. Wilburn, commercial manager at Woodstock. The new district is comprised partly of exchanges taken from the old Evanston district, of which Chas. T. Ford of Waukegan is manager.

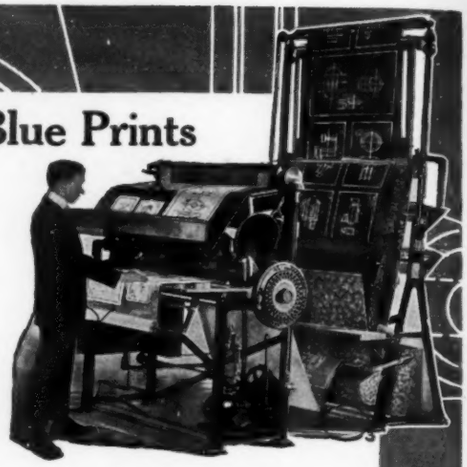
United Telephone Co. Incorporated at Texarkana

The United Telephone Co. has been incorporated at Texarkana, Tex., by A. C. Stuart, T. W. Offenhouser and Chas. Milliger. Capital, $125,000.

P. G. Seaman, who has been manager at Cordele, Ga., has been made manager for the Southern Bell Telo. & Teleg. Co. at Brunswick, Ga., vice R. E. L. Reddy, promoted to the company's office at Savannah, Ga.

Print Your Blue Prints in One Operation

¼ the Cost in ½ the Time



Think what these savings mean to you. Your blue prints—printed, washed and dried in one operation—in your own drafting room—at one-fourth the cost and in one-half the time with one operator. You can do this with a Pease Peerless Blue Printing Equipment.

The Peerless can be operated to advantage whether you print ten yards or the full capacity of one hundred and twenty yards per hour. Besides there are no open wash trays—no wet floors—no lines of dripping prints—no waste of sensitized paper. The equipment is noiseless and will go in 5½x6½ feet of floor space.

Mail the Coupon

Why not get more information for your plant? Clip the coupon and mail it today. An interesting catalog will be on your desk in a few days.

The C. F. Pease Company
807 North Franklin St.
Chicago, Illinois

The C. F. Pease Company,
807 N. Franklin St., Chicago, Ill.

Gentlemen:—
Please send me a copy of your M-23 Catalog which describes the Pease Peerless Blue Printing Machine and gives full information on your complete line of blue printing machinery.

Name Company

City State

UNIVERSAL MAP DISPLAYORS SOLVE THE PROBLEM OF VISUALIZING MAPS WITHOUT INCONVENIENCE OF STOOPING, REACHING OR TAKING UP LARGE SPACE

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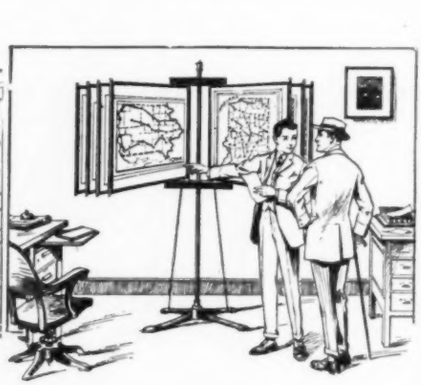

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For Maps, Charts, Diagrams, Photos, Distribution Maps, Blue Prints, Progress Charts, Transmission Systems, Advertising Copy, Graphic Records and the many other items that enter into an executive's duties. By thumbtacking or mounting your subject matter on the swinging wings of Universal Displayors, you have an instant picture of your problem easily accessible.

The wings are made of rigid steel frame, electrically welded, with thumbtack board fillers covered with finest green Dundee burlap or mounted with green paper to give smooth writing surface.

In use for years in numerous offices of A. T. & T. Co., New York Telephone Co., Bell Telephone Co. of Pa., other Bell Companies, Western Union Telegraph Co., Postal Telegraph & Cable Co., Western Electric Co., General Electric Co., Westinghouse Electric & Mfg. Co., Westinghouse Lamp Co., New York Edison Co., Brooklyn Edison Co., Philadelphia Electric Co., Detroit Edison Co., Consolidated Gas & Electric Co., Baltimore, Pennsylvania Power & Light Co., various domestic and Latin American properties of the Electric Bond and Share Co., etc., etc.

Other types and larger units besides those illustrated here.

Many wing sizes; a few are 20x30", 24x36", 30x40", 36x48", 48x60", 50x48", etc., etc. Write for our catalog No. 14 and prices.

Tell us your problem, we will help solve it and recommend most suitable kind and size.

UNIVERSAL FIXTURE CORPORATION **135 West 23rd St., New York**

Exact Accounting Important

The Price of Financial Success Is Accurate Accounting—Reports to Stockholders, Commissions and Tax Bodies Can Accurately and Easily Be Made if Books Are Kept Properly

By JOHN W. COFFEY, C. P. A.

(Paper Before Convention of Indiana Telephone Association)

With comparatively few exceptions, the orders issued by the Interstate Commerce Commission in 1912 relatively to the accounting requirements for class A and class B telephone companies effective January 1, 1913, were not very enthusiastically received, and there was much grumbling, especially among the class B companies. In fact most of the latter class delayed making the change just as long as possible, and it was several years before some of them realized that they were gradually getting into deeper water, each year that they postponed adopting the prescribed schedules.

A great number of this class contrived to satisfy the commission with reports made from their "home-made systems" of accounting; but it soon became apparent, all things considered that the additional work, worry and uncertainty of "what might happen" if it were discovered that the reports did not coincide with the actual office records, that some sort of uniform accounting system was necessary. These companies, very reluctantly, began to look for a system that would simply answer the requirements and one that would require the least amount of attention and cost the least amount of money. They wanted the very latest type of switchboard, cable, underground, etc., but a record of these transactions was considered non-essential. Therefore, through force, you might say, the Independent telephone man has been educated to the necessity and the value of proper accounting.

A little later on the states having public utility bodies, passed laws giving the latter jurisdiction over the telephone utility. With but one or two exceptions, these state commissions adopted practically the same schedule of accounts, but included class C and class D companies. This brought on a real storm of protest, and some of the latter companies are still kicking.

The state commissions were more patient and exceedingly lenient, realizing that a majority of the smaller companies imagined they were being imposed upon and hoped through this method to soon convince them of the importance and of their own appreciation of the need of better accounting; they were advised that if their records proved that their earnings would not warrant the expense, the rates would be increased accordingly; but while they were very anxious for the increase, they were not willing to spend any of it for accounting.

At that time the plan adopted by the commission seemed logical and very commendable, but as time went on and the companies found that they could "get by" with any kind of a report, they ceased taking the order very seriously, and only awakened to their sorry predicament, when making application for increased rates, and when the Internal Revenue Department began to check up on past reports, so apparently it would have been better for all concerned had the commissions accorded them the same treatment that they did the class A and B companies.

All companies that complied with the commission's order very soon learned to appreciate its true value—not alone because they found it easy to prepare government and state reports, but from the fact that they had found an intelligent guide to the successful operation of their property, and now it is very doubtful whether any of these managers would accept a managership for a company who had no way of knowing whether the annual results were good or bad. The successful telephone manager needs two good eyes all the time, and he is not going to gamble with the stockholders' money blindfolded.

The fellow who continued to operate without any knowledge of what he was actually doing continued to get into trouble and lived from day to day in constant fear of a visit from some government or state official.

A majority of the smaller companies, and some of the larger ones that have sold out during the last few years, were companies who thought bookkeeping, other than a subscriber's record and a bank pass book, were foolishness and a waste of money. They had been eating their own fat for years but did not realize it. Every few weeks we learn of some company selling out, but in most instances there is very little money, if any, changing hands, and it is more often the unloading of a liability, or the tragic end of a once prosperous undertaking that should have made its stockholders an earning on their investment, rather than complete loss, all of which can only be charged up to poor and near-sighted management, which would have been detected by the keeping of accurate accounts.

Here and there you will still find a company who like the bank clerk that believes he is shrewder than others who were caught, but just as surely lands in the same trap—so will be the final ending of such companies. Again I say, it would have been better had the commis-

As a golfer, John W. Coffey is one of the ablest telephone accounting specialists in the business. He is a practical telephone man of extensive experience and at present, among other duties, is making use of his ingenuity and knowledge of the business in helping out the Southern Michigan Telephone Company, having been appointed receiver for that property.

This photograph of Mr. Coffey was taken at the Park Ridge Golf Club, Park Ridge, Ill., where George Rodormer sought to teach Jack some of the ancient game's fine points.

John W. Coffey, Indianapolis

Pay your way to the convention by your profit from Ever-Protect

What **EVER-PROTECT** Cable Compound is saving telephone companies in the course of a year would pay the salaries, transportation, and hotel expenses of the entire attendance at the Independent convention, and then some.

That is a conservative estimate based on the experience of the hundreds of telephone companies that are using **EVER-PROTECT.**

At the Independent Telephone Convention in Chicago you will have an opportunity to talk to scores of the most successful and practical telephone men in the business—ask them what they know about **EVER-PROTECT.**

Stop in at the **EVER-PROTECT** convention exhibit, and see for yourself how logical it is for **EVER-PROTECT** to protect you against chemical action, electrolysis, moisture, checking, and other influences that attack cable.

Learn at the Chicago meeting how cable underground without conduit has been proved completely practical and profitable when **EVER-PROTECT** is being used.

Consider this evidence and see for yourself how comparatively little it would cost you to get a real plant, a safe, modern, money-making layout with your investment and your peace-of-mind safely hidden away from the elements that attack your outside plant by strength and by stealth.

You will hear an overwhelming volume of evidence of **EVER-PROTECT'S** certain value to you. It will be testimony to convince you that you must make the use of **EVER-PROTECT** one of the first things you do when you get back home.

Able telephone men like Max Hosea will tell you that they woud not think of burying a piece of underground cable without the use of Ever-Protect compound.

You will get stories of other experiences like that of M. M. Herron, general manager of the Millersburg, Wooster and Orrville Telephone Company of Millersburg, Ohio, who wrote us:

"We have been using your Ever-Protect Cable Compound for from six to eight months, repairing aerial and underground cable and burying duplex wire. We have forty barrels of compound on hand to use this season on cable that we expect to bury.

"Where we have crystallized aerial cable, we boil it out and build it up with **EVER-PROTECT** Compound and we have had no trouble at all.

"We had a 50 pr. cable buried in the ground without compound, and electrolysis punctured the lead sheath on 60 feet of the cable; we dug down to the cable, cut the lead off the full length and left it off, boiled it out and built it up with Ever-Protect Compound over a wrapping of tape, and buried it with water in the bottom of the trench, and it has been working six months with no trouble at all.

"We bury duplex wire, 1 pr. or more, and coat it with compound in the same way that is recommended for cable.

"We have lots of faith in your **EVER-PROTECT** Compound."

When you talk over with these men you will meet at Chicago, what you can save by using **EVER-PROTECT,** you are bound to apply it at once in your plant.

And this winter you're bound to save enough to far more than pay for the expenses of your convention trip by what **EVER-PROTECT** Cable Compound will keep on the profit side of your ledger.

Only a few more weeks of good weather left—start using **EVER-PROTECT** now.

Order from your nearest jobber or direct from us.

THE NATIONAL CABLE COMPOUND CO.

INCORPORATED

MITCHELL, INDIANA

sion been just as strict with the smaller as with the larger company. It would have been the saving of millions of dollars to unsuspecting stockholders.

My organization has installed systems, made up audits, Government and state reports, prepared rate cases, etc., for hundreds of companies in nearly every state in the union and you may or may not be surprised when I tell you we have found many of them paying good big dividends when in fact an analysis of their records disclosed the fact that they had not made half of it, and in some instances were running behind year after year. It is not difficult to guess what the final result would have been, had this condition been allowed to continue. Unfortunately, it is too easy to make a losing proposition look prosperous on paper; it is in fact a very hard and tedious task even with all of the present modern facilities and intelligent corps of employes from the ground man up to the highest active official, to keep your records so that they will at all times coincide with an accurate appraisal of the plant; so that one need not draw on his imagination to a very great extent to conceive the enormous discrepancy that is bound to exist, where the accounting is simply a secondary matter, or only carried on in order to comply with the law and for convenience in filling out certain forms at the end of the year.

Stockholders in every public utility should be advised of the requirements of the Public Utilities Commission, and brought to understand that these laws were made for their benefit and protection, and they in turn should make their directors responsible through heavy bond, to see that records of their company are kept in such a manner as to reflect the true condition of affairs. The manager's bond to the directors will keep him on his toes to the extent that he will inspect very carefully all work and reports pertaining to additions to plant, retirement of capital assets, will see that labor and materials are not charged to capital accounts where the plant is simply being replaced, or charged against the depreciation reserve when the repairs are actually maintenance. As stated before, it is unfortunate that it is too easy to make a losing proposition look good on paper; I do not mean that in every instance it is premeditated or intentional; I have found the latter true, but it is more often the result of ignorance or carelessness. Where it is intentional there is a reason; if the manager is not a heavy stockholder he is perhaps more interested in making a good showing, which means continued employment with perhaps increased salary; if it is a matter of ignorance or carelessness the crime is with the directors for his continued employment. The juggling of these accounts is simply the juggling of the stockholders' money, and is no different than the juggling of the depositors' cash by the dishonest bank clerk. One is actual cash, the other is the equivalent.

The average stockholder is not competent to analyze a utility report and can only pass judgment upon the final results. The report shows so much invested in capital accounts. Is there? The report also shows so much in materials and supplies. Is it there? The report shows many other assets, including a sufficient reserve for depreciation. Are they there? How is he to know?

He gets his report from the bank stating that he has so much to the credit of his personal account and he knows absolutely that he has. If he is a stockholder in a bank he gets his quarterly, semi-annual or annual report stating that the resources are so much. He knows that to be a fact. Why? The Federal and state laws provide for a uniform system of accounting and for a rigid inspection by competent bank examiners. In addition to insuring against loss, all employes are bonded so that the investors as well as the depositors are fully protected.

Why should not the telephone stockholder be equally protected? He can be if he will exercise his rights and privileges as outlined above. His reports from the directors should be just as accurate and reliable as his bank reports. If his directors are properly made responsible they will see that not only the accounts are checked up at least once a year, but that an appraiser is called in occasionally to verify the charges to capital accounts.

It is seldom that the telephone stockholder gets other than a verbal report; more often a report read at the annual meeting is the extent of the investors' information and advice as to what has been going on during the previous year. If he happens to be one of the large stockholders he may be favored with some inside information, but if he happens to be "out of the ring" he may just as well have remained at home. We happen to have a few companies who print and furnish each stockholder with a copy of the final report as compiled by us at the close of the fiscal year. The report is condensed and brief, but contains, in addition to the financial statement, a memo of all important transactions, during the past year, the additions to plant itemized, retirements of any consequence and explanation as to any material increase or decrease in revenues as compared with the previous years. You can imagine the satisfaction the stockholders derive from these reports, and how ready they are to co-operate when an emergency arises. The Interior Telephone Company of Grinnell, Iowa (H. L. Beyer president and G. L. Saunders manager) has continued this practice since 1913 and it is needless to state that that company is prosperous, with a contented lot of stockholders. If this condition existed throughout the Independent field, we should find many more prosperous companies, and fewer plants for sale. Neither should we find so many companies struggling along looking for some one on whom to unload a complete failure, the result of poor management through trying to operate property with every employe blindfolded. If you are to know how many miles you motor, your car must be equipped with a speedometer; likewise if you are to know what your plant is doing, so that you may correctly and conscientiously advise your directors and stockholders, you must be equipped with the proper records that are just as accurate and reliable as a speedometer.

If there are any companies at this convention that are trying to operate with a makeshift accounting system that does not tell the whole story monthly, don't fool yourselves any longer, or gamble with your stockholders' money simply because they have faith in you; get an accounting outfit from which you can furnish a true comprehensive statement, monthly, quarterly or annually; you will find that the money invested will be "bread cast upon the waters which will return to you." You may be compiling a memorandum of your receipts and expenditures from which you are able to fill out the required reports to the commission annually, but unless you are posting these accounts into a general ledger, taking off a trial balance monthly, showing in detail your real assets, liabilities, income and expense accounts, you are wasting your time and money. While it is necessary to make your reports to the commissions, yet that should be of the least interest to you. You want something to guide you as you go along; something to show you for a certainty at the close of each month whether you made something, or lost, after setting up the fixed charges such as interest, taxes, reserve for accrued depreciation, etc. A very few more dollars invested annually in the proper forms will give you this information, and it will require only a few minutes from time to time to keep them up to date.

In closing let me impress upon your minds again the subject of this address, "The Value of Accurate Accounting." It means the very foundation of your investment. An effort to make a loan in a community where you are not personally known will soon convince you that regardless of the value of your property, the banker will not consider your application without a certified financial statement, and this cannot be furnished unless there are records to support it.

NATIONAL CABLE RINGS

Time saved on installations plus time saved in service of long duration really determine the value of National Cable Rings.

Just two fast movements of the hand and the ring is in place. Once up it's there to stay. The tension grip has made National popular. And don't overlook that feature of ample reclipping space. Made in all necessary sizes.

The NATIONAL TELEPHONE SUPPLY COMPANY

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Manufacturers

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In Cargo or Tank Car Lots

We can supply your needs for Creosoted Oil—whatever they may be, from a tank car to a cargo, and we can make prompt shipment of the best imported oil. We have large storage facilities and a private wharf for ocean vessels at our New Orleans plant. Quantity buying and low-cost handling enable us to furnish the highest quality of imported oil at prices that will save money for you. Get our quotation before you place your next order, whether large or small.

We Supply Dependable Creosoted Materials

No matter what you may need, in the way of creosoted materials, we can supply it. Our plants are conveniently located with respect to raw materials, have modern equipment, skilled operators and unexcelled shipping facilities. Carefully selected stocks and uniform penetration of the oil guaranteed.

Piles	**Poles**
Cross Ties	**Lumber**
Bridge Timbers	**Cross Arms**

Paving Blocks

Anything Creosoted

Special orders filled to your specifications. Prompt shipments made by rail or water to any point in the world. It will profit you to know more about our products and our service.

American Creosote Works, Inc.
New Orleans, La.

Savannah Creosoting Co. Inc.
Savannah, Ga.

Combined Capacity of Plants 150,000,000 Ft. B. M. Annually

PLANTS

New Orleans, La. **Louisville, Miss.**
Winnfield, La. **Savannah, Ga.**

Radio a Public Utility

Abstract of Address by Secretary of Commerce Hoover Before Third National Radio Conference—Outlines Problems of Radio Communication and Indicates Possible Solution for Difficulties

By HERBERT HOOVER

Radio has passed from the field of an adventure to that of a public utility. At the first radio conference, I hazarded some modest anticipations as to its development and use. Some thought them visionary—yet we passed every point of these anticipations within eighteen months. We have, in fact, established an entirely new communication system, national in scope.

We may well be proud of this wonderful development, but in our self-congratulation let us not forget that the value of this great system does not lie primarily in its extent or even in its efficiency. Its worth depends on the use that is made of it.

At each succeeding conference we have had more difficult problems to solve, and those which we present today are of a complexity greater than ever before. In a large sense, the purpose of this conference is to enable the listeners, the broadcasters, the manufacturers, and the marine and other services to agree among themselves as to the manner in which radio activities are to be conducted. We have made great improvements in material transmitted. Original music, speeches, instruction, religion, political exhortation, all travel regularly by radio today. But we require a still further advance in the character of material, beyond the capacity of local station directors, if the art is to emerge entirely from the curio and entertainment stage to that of fundamental service.

Suggests Thorough Organization for Future

Experimental broadcasting upon a national scale during the past year has now brought us to the stage where we know it can be done. The local station must be able to bring to its listeners the greatest music and entertainment of the nation, but far beyond this it must be able to deliver important pronouncements of public men, it must bring instantly to our people a hundred and one matters of national interest. To this it must add its matters of local interest. This can only be accomplished by regularly organized interconnection on a national basis with nationally organized and directed programs for some part of the day in supplement to more local material.

It is our duty to consider the possibilities and potentialities of interconnection as a regular daily routine of the nation. Unless it be systematically organized we cannot expect its continuation. I realize that this matter, except insofar as it may be fostered and encouraged, dose not lie in the Government. It would be unfortunate indeed if such an important function as the distribution of information should ever fall into the hands of the Government. It would be still more unfortunate if its control should come under the arbitrary power of any person or group of persons.

Radio Advertising Would Kill Broadcasting

I believe that the quickest way to kill broadcasting would be to use it for direct advertising. The reader of the newspaper has an option whether he will read an ad or not, but if a speech by the President is to be used as the meat in a sandwich of two patent medicine advertisements, there will be no radio left. To what extent it may be employed for what we now call indirect advertising I do not know and only experience with the reactions of the listeners can tell. I do not believe there is any practical method of payment from the receivers. I wish to suggest for consideration the possibility of mutual organization by broadcasters of a service for themselves similar to that which the newspapers have for their use in the press associations, which would furnish programs of national events and arrange for their transmission and distribution on some sort of a financial basis just as the press associations gather and distribute news among their members. It may be that we cannot find a solution at this moment but I believe that one result of this conference should be not only the consideration of this question but the establishment of a continuing committee for its further consideration.

The Problem of Wave Lengths

One of the most important subjects for your consideration is the providing of operating channels for broadcasting stations. Of the present 530 stations, 57 are Class B, operating on from 500 to 1,000 watts and having a wide range, and 387 are Class A, many using small power and covering small areas. There are still 86 Class C stations, most of which have low power, all on a wave length of 360 meters. Our chief trouble is with the Class B situation. They are all assigned within the band of 288 to 545 meters, within which there are, under the present system of allocation and excluding the Class C band, only 44 available channels, and only 33 that seem desirable at present. The greatest congestion is in the large cities, New York and Chicago particularly. A recent survey made by the supervisors of the various districts shows that 21 new Class B stations are now under construction and that 25 others are contemplated, so that the question of allocation is one of increasing difficulty.

In the light of scientific and technical development in both transmitting apparatus and receiving sets, it may be that a different plan of zoning or of station separation may now be used, thus creating additional wave lengths for assignment. I am not advising any particular method of solution, but recommend the entire subject to your careful consideration.

Power of Broadcasting Stations

Another question of importance is the limit of power to be used in broadcasting. Most Class B stations are now operating on 500 watts. A limitation of 1,000 watts is imposed in the license. I understand that there are several stations erected or in course of construction which contemplate the use of power up to 5,000 watts, and I am aware of the suggestions of those who would go beyond even this. From the viewpoint of nation-wide broadcasting, the question becomes as to whether we should aim to cover a large territory through a single powerful station or through a number of interconnected smaller ones. We must not stifle progress in any direction. We must not do anything that will interfere with the programs of local stations on which many of our people depend, nor with the wide selective range which they now have. It may be that both purposes may be accomplished without loss to either. I recommend the subject for your most careful consideration and hope that you may be able to reach a satisfactory conclusion.

General Tendencies in Broadcasting Development

There seems, at present, some tendency towards a decrease in the total number of broadcasting stations. September 1, 1923, there were 563 licensed stations. On the same date this year, the number had fallen to 533, a loss of

30. It is of some interest to classify and study the ownership of the stations. So far as is known to the department, of the present stations, 196, or over one-third, are owned and operated by manufacturers of or dealers in radio apparatus, whose interest is, of course, apparent. Department stores and similar mercantile concerns add 39 to this number, and publishers 41, making a grand total of 276 known stations, of which 44 are Class B, which may be said to have a direct interest in the publicity legitimately resulting from their own broadcasting. On the other side we have 85 educational institutions, 35 churches, 12 city and state agencies, 12 clubs, of which 7 are Class B (4 schools, 2 state or city agencies, and 1 church), all of which may be said to operate from more altruistic motives.

As Applied to Marine Service

Those who are engaged in the use of radio for marine services, between ship and shore and ship and ship, feel that the present band devoted to their use is too narrow. We must not forget that what is a convenience or a pleasure for us is a necessity for them and that life may depend on the efficiency of their communication service. There is undoubtedly congestion along our coasts, particularly in the vicinity of such harbors as New York, Boston, and San Francisco. There are two fundamental troubles in the situation, and they are interdependent; first, the character of the apparatus used; and second, the fact that most ships operate on only two wave lengths, 600 and 706 meters. Practically all marine radio equipment is of the spark type. There can be no economical use of wave lengths until this condition is remedied.

The situation among ships today is much the same as existed in broadcasting at the time of the last conference when all stations were trying to operate on 360 or 400 meters. Possibly additional wave lengths above 600 meters may be assigned for marine use. I commend the subject to your careful attention.

Outside Sources of Interference

One matter that must be dealt with sometime, but over which there is no means of control at present, is the interference from non-radio sources. We listeners have, all experienced frequently and to our great disgust the squeals and roars which we are told come from electrical devices of various sorts in which there is no purpose to cause audible disturbance. Harmonics, too, are troublesome. Our amateurs, who make up by far the largest element in the radio family, outside of the listeners as a whole, are particular sufferers since the harmonics from many stations have an especial tendency to invade the amateur band. Accurate and sharp transmission must be insisted upon.

Co-operation of the Department

The Bureau of Navigation, having direct charge of administrative features and full familiarity with the entire situation, is ready to give information and advice. The Bureau of Standards has prepared a report on many of radio's technical phrases and its personnel and facilities are at the public's disposal. The Interdepartment Radio Committee has done preparatory work, and its members will co-operate in the consideration of all matters which have a governmental bearing. The Radio Supervisors from all districts of the country have first-hand information as to conditions, and their knowledge is based on actual experience in the field. In short, the Department of Commerce is at your command. Your membership includes every angle of radio interest. I look forward to great development and progress in the industry.

Ottawa, Ill.—The United Telephone Co. of this city has been taken over by the Illinois Bell Telephone Co. Fred Beem will remain as manager. V. J. Duncan, who has been president; Albert Persons of Springfield, vice-president, and Albert F. Schoch, secretary and treasurer, all sever their connections with the company.

Work on a $100,000 addition to the Lima (O.) Telephone Co.'s building, at Spring and Elizabeth streets, will be rushed to completion this fall, says George H. Metheany, general manager.

Clarinda, Ia.—The Farmers Mutual Telephone Co. has absorbed the lines of the Northwestern Bell Telephone Co. which have been in service in this city for many years. F. M. Lantz, who has been manager of the Farmers Mutual Co. here, will be the manager of the consolidated lines.

Waco, Tex.—The Long Distance Telephone Co. of Texas, capital $200,000, has been incorporated by J. B. Earle, W. H. Earle, Waco; E. C. Blomeyer, V. E. Chaney, W. E. Jones, Kansas City, Mo. It is understood that the new company is formed to take over the Texas Long Distance Telephone Co., the Texas Toll Lines company and other telephone properties. Officers of the new company will be: President, J. B. Earle, Waco; vice president and general manager, E. C. Blomeyer, Kansas City, Mo.; secretary-treasurer, V. E. Chaney, Kansas City, Mo.

Mechanicsburg, O.—The Mechanicsburg Telephone Co., Mechanicsburg, has been incorporated with a capital of $10,000 by V. G. Riddle, D. J. Burnham, P. J. Burnham, J. J. Culbertson and H. C. Rogers.

O. J. Holbrook Dies at Chicago

Chicago, Ill.—Orrin J. Holbrook, assistant to the vice-president of the Illinois Bell Telephone Company, died recently, as the result of a cerebral hemorrhage. Mr. Holbrook, who was in his seventieth year, was born in Michigan and came to LaGrange, Ill., in 1891, entering the real estate business. In 1893 he assisted in the establishment of a telephone exchange in LaGrange and then entered the employ of the Chicago Telephone Company. For many years he was commercial superintendent and was active in developing exchanges in the Chicago suburban division. He is credited with having promoted the first rural telephone line in the United States. This was at New Lenox, Ill.

Telephone Reports to I. C. C. Show Increase

Washington, D. C.—Telephone earnings of 72 companies reported to the Intersate Commerce Commission for June and six months compare as follows:

	1924	1923
June gross	$57,982,359	$53,866,538
Net op. inc.	12,028,124	11,278,794
6 mo. gross	342,927,781	319,778,394
Net op. inc.	71,284,358	71,665,203

Patriot, Ind.—The Farmers Telephone Co., of Patriot, has discontinued operations and all their subscribers will be served by the Ohio River Telephone Co., a five year contract having been signed. The Farmers Co. sold its switchboard but retained its lines and telephones and its subscribres will be given service through the Ohio River company's Patriot exchange at a reduced rate. The contract was signed by directors of the Farmers company and C. R. Green of the Ohio River Company.

Penn Yan, N. Y.—The annual convention of the New York Up-state Telephone Association was held Saturday, September 27, in Penn Yan. Some 109 delegates from various companies attended. D. C. Cox, of Syracuse, and J. A. Healey, of Buffalo, were the principal speakers.

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New Submarine Cable

United States Now Enjoys Additional and Better Communication with Europe.

New York—With the completion of the new submarine cable from New York to the Island of Fayal in the Azores, and the later extension of this cable to Rome and to Emden, Germany, direct telegraphic connection between the United States and northern and southern Europe will again be established. Important commercial developments are expected to come as a result of improved communications. The cable itself is different from any submarine cable previously laid. Through the development of the new alloy of nickel and iron (called permalloy) which is used to form a continuous loading of the cable conductor, the speed of transmission is expected to reach 1500 letters per minute. The best of the preceding cables of the same length do not permit the transmission of over 300 letters per minute.

The cable conductor consists of a single copper wire around which is wrapped a spiral winding of six copper tapes. Around this core is wrapped the permalloy tape which increases the inductance of the circuit in the manner familiar to telephone and telegraph men. On account of the higher speed of transmission, it was necessary to develop entirely new means of transmitting and receiving, as the older systems were limited in speed, although sufficiently fast for the slow speed cables in use up to this time.

Monroe, La.—A $200,000 exchange building is to be built by the Cumberland Telephone and Telegraph Company here.

Western Electric Sales Grow Over 1923 Figures

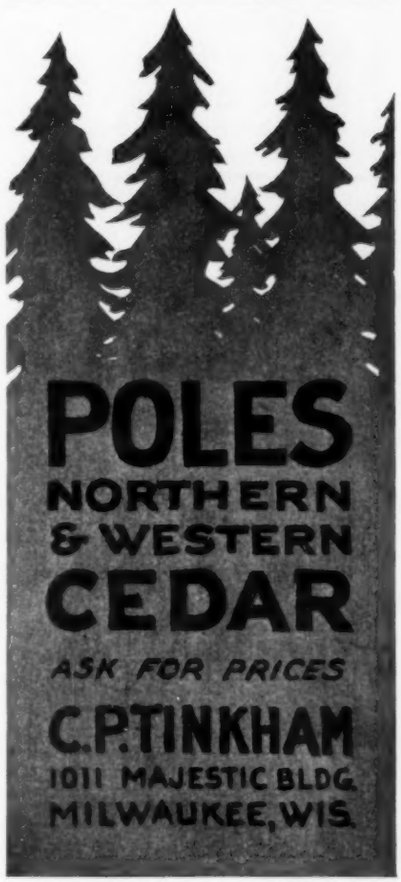
New York, N. Y.—An increase of $37,676,000 in the sales of the Western Electric Company is reported for the first eight months of 1924 during which the billings reached a total of $195,167,000. Orders received during the first eight months of this year totaled $198,892,000 or $7,566,000 more than the orders received during the same period of 1923.

Wetumka, Okla.—Approximately $10,000 will be spent in improving the Wetumka telephone plant, according to Messrs. Thompson and Schooler, the new owners of the property.

Merger Planned if Public is Willing

Butler, Pa.—Merger of the Peoples and Bell telephone companies into one system for Butler is ready to be effected if the people want it, says James H. Wright, a director of the Peoples Telephone Company. The Independent company has secured an option to buy out the Bell system. The total cost of the properties, as consolidated, will be $1,266,000, and the new company will have a total of 8,300 stations. If the proposed consolidation is approved by the public, the merger and the new construction will require from six to eight months to effect.

San Angelo (Tex.) Telephone Co. is spending $50,000 on improvements and extensions and will add 1,000 new telephones in the near future. John Y. Rust is president.



New York Engineer Invents New Call Register

A new registering apparatus to be used in connection with a telephone set has been invented by Benedetto Sapienza. The device requires no change in the wiring of the telephone set. A battery energizes the recorder. Calls made in absence of attendant at subscribing station are registered, so, according to the inventor the subscriber may learn from the central station the numbers of those who called while the receiving station was unattended.

This device is a great improvement for telephone use and makes it possible for telephone companies to make extra charges on this special service. Write for details.

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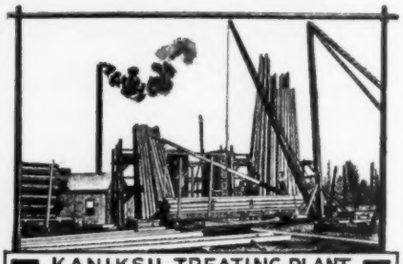
Sergius P. Grace Joins W. E. Engineering Staff

New York, N. Y.—Sergius P. Grace has been appointed commercial development engineer for the Western Electric Co. He has been general supervisor of by-products for the American T. and T. for the last two years, and for many years prior to this work has been associated with Bell companies. He graduated from the University of Michigan in 1896 and immediately engaged in Independent telephone work. In 1900 he entered the Bell ranks as superintendent of equipment for the Southwestern Bell Telephone Company of Texas.

South Dakota Picks Aberdeen as Convention Site

Aberdeen, S. Dak.—Executives of the state Independent telephone association have selected Aberdeen as the place for the organization's next annual convention, which will be held in January, 1925.

Moscow, Ida.—A betterment campaign involving expenditure of $30,000 for equipment has been started by the Moscow Telephone and Telegraph Company.



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American Announces New Burns Reproducer

Chicago, Ill.—The new Burns reproducer has a horn of generous proportion, gracefully shaped and designed along scientific lines. The flare, 14 inches in diameter, is made up of handsomely

New Burns Radio Reproducer

polished black pyralin. This is practically unbreakable and gives a distinctive, rich appearance to the instrument. The aluminum sound column and pyralin bell are practically non-vibrating.

The Burns speaker is also made up in a more elaborate "De Luxe" model. The flare of the horn is of mahogany tinted, semi-transparent pyralin.

The No. 205 speaker, its makers state, is an instrument of extreme sensitiveness yet is capable of great volume and harmony. The quality of reproduction is of remarkable clearness. They add: "The volume of tone in this instrument surpasses that of many higher priced speakers which use in some instances over an ampere of battery for operation. In addition to the large volume of tone, the Burns Speaker is surprisingly free from distorted or false tones and raspy sounds.

The well-known Burns Speaker Unit is employed. This has a convenient adjuster for regulating tone and makes it possible to adapt the speaker to any type of receiving set, regardless of the current output or batteries employed. No additional or separate batteries are required for the Burns speaker.

There is no absorption of tone or loss of volume with the free unobstructed curve of this horn. The shape of the bell has been designed to give best acoustic results, as also has been the selection of the materials employed. The horn is well balanced on a wide staple base on which it freely swivels, thus permitting the horn to be turned readily in any direction. Parts are built along substantial lines assuring rigidity and serviceability.

F. P. Lawrence, of Oklahoma City, Okla., plant superintendent for the Southwestern Bell Telephone Co., has been transferred to St. Louis to succeed Philip Hogan as plant superintendent for

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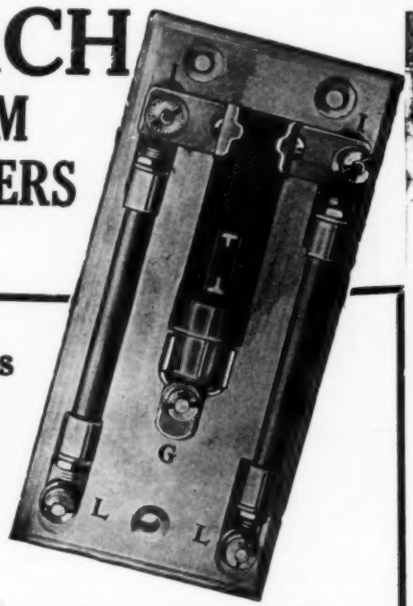

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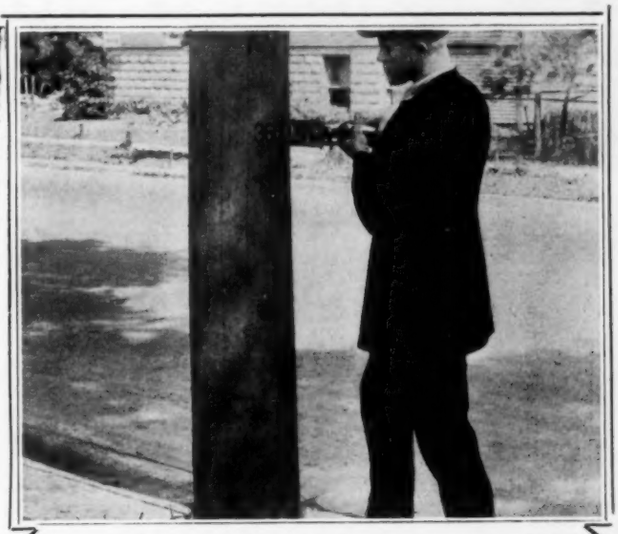

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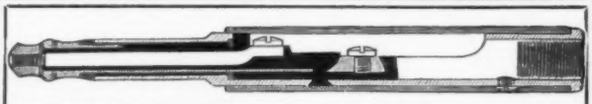

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Missouri and Arkansas. J. J. Hayes, division plant superintendent for western Missouri, has been promoted to plant superintendent for Oklahoma, to succeed Mr. Lawrence.

Rochester, N. Y. Boasts Model Manual Equipment

Rochester, N. Y.—The recently completed Glenwood central office of the Rochester Telephone Corp. is regarded as one of the most modern, manual switchboard equipments in service. The office was built in 1914-1915, and in 1923 work was started on a building addition which more than doubled the size of the building. A complete new switchboard equipment of 40 A positions and 12 B positions with 5600 lines has been installed. The B board is largely on a straightforward trunking basis which, officials of the company say, has improved trunking service materially.

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L. G. LeBourveau in Southeast for Belden

Chicago, Ill.—L. G. LeBourveau, one of the well-known veterans in the Independent telephone sales field, has been appointed southeastern representative for the Belden Mfg. Co. of Chicago. Mr. LeBourveau's headquarters are at 708 West Twenty-ninth street, Jacksonville, Fla.

London, England—There now are 425,920 telephones in the London area.

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Sixty-Fifth Consecutive Quarterly Dividend

The regular quarterly dividend of $1.50 a share on the common stock, and the Class "A" and the Class "D" preferred stock, together with a dividend of $2.00 a share on the Class "C" preferred stock, has this day been declared payable October 1, 1924, to the stockholders of record as of the Twenty-fifth day of September, 1924, at 3 p. m. The books will be closed to transfer on September 25, 1924, and reopened on October 1, 1924.

Sept. 23, 1924. (Signed) H. L. GARY, First Vice-President and Treasurer.